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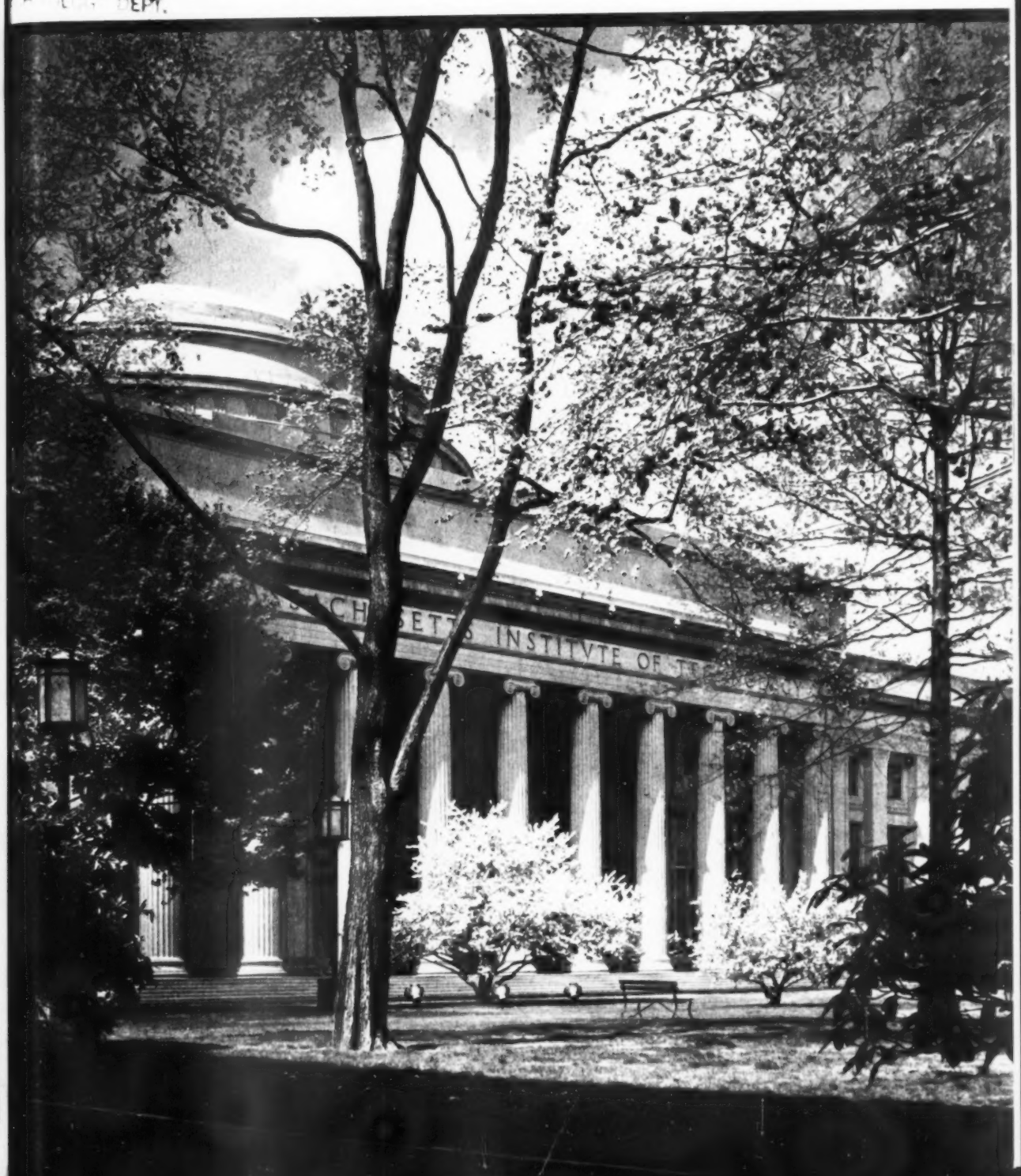
TECHNOLOGY REVIEW

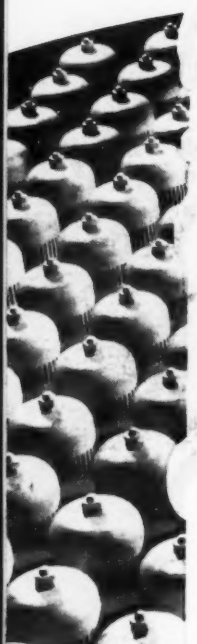
July 1951

DEPT.



DISTILLATION

processes and equipment for ...



• • • the separation of hydrocarbons or other organic chemicals, should be designed for efficiency in terms of overall operating costs and amortization of capital investment. Tray efficiency, cleaning facility and resistance to corrosion are the prinicipal factors to be considered. For practical purposes, tray efficiency or tray spacing may be reduced to keep tower cost at a minimum. A balance of utility costs against chemical recovery may indicate the desirability of sacrificing some of the recoverable material, with a corresponding reduction in the capital outlay for columns and associated calandrias, condensers and heat exchangers. Particularly when potential changes in process or product specifications are foreseen, distillation columns with sectional shells and removable trays of light alloy construction offer special opportunities for economy because of the ease of transfer from tower to tower as well as cleanability and resistance to corrosion.

DISTILLATION ENGINEERING AND EQUIPMENT

Write for copy of technical bulletin "Distillation Engineering and Equipment"

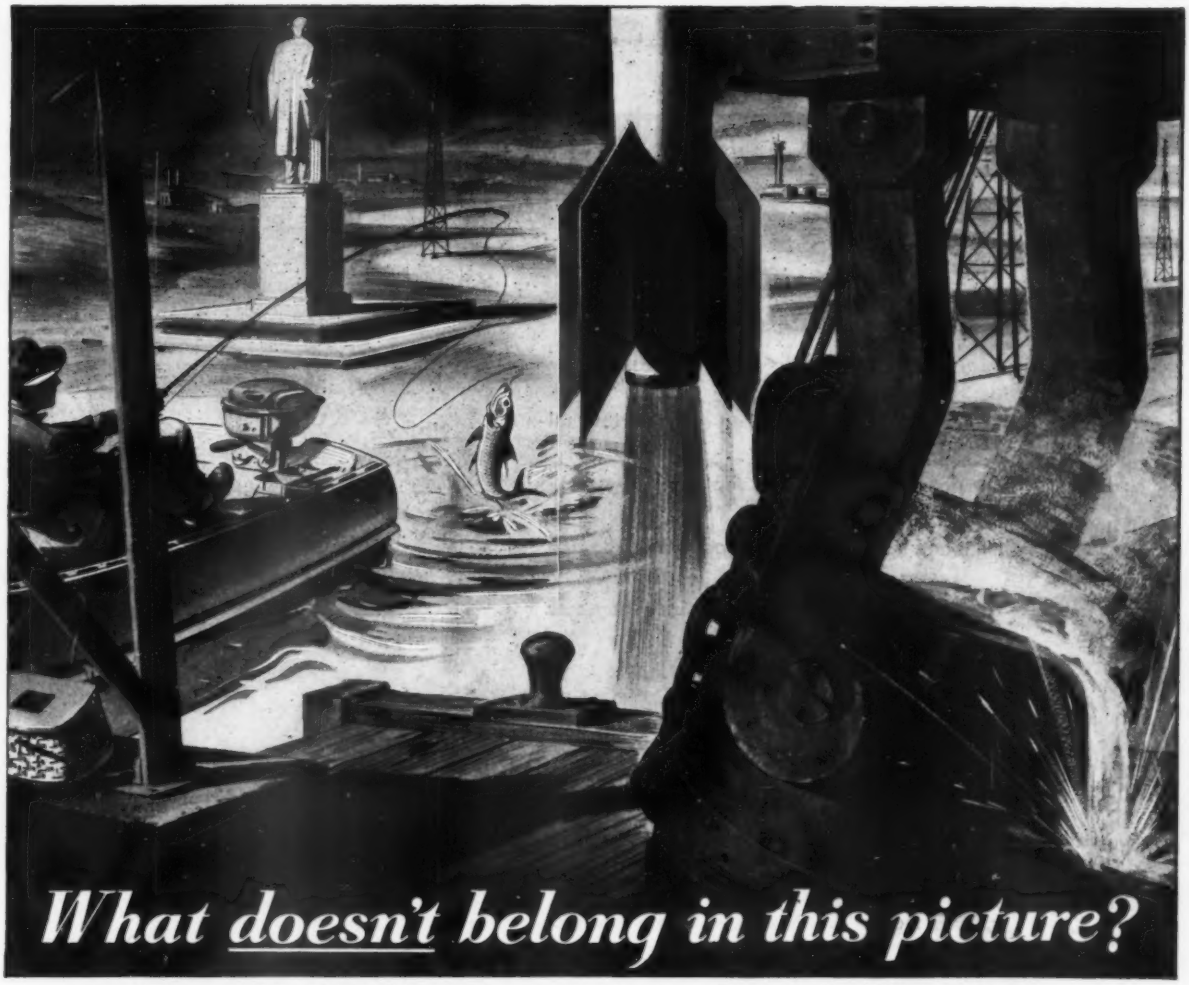
50 Years of Service

VULCAN • CINCINNATI

ENGINEERS AND MANUFACTURERS OF PROCESS PLANTS AND EQUIPMENT

General Offices and Plant, CINCINNATI 2, OHIO

PHILADELPHIA · BOSTON · SAN FRANCISCO · BUENOS AIRES • VICKERS VULCAN PROCESS ENGINEERING CO., LTD., MONTREAL, CANADA



All but one of the objects in this picture have something in common. They were affected directly or indirectly by the kind of products Norton and Behr-Manning make. *Can you find the stranger?*

The TV towers? No! Made of metal, which is processed and finished with the aid of Norton or Behr-Manning abrasive products.

So, too, with many other TV components . . . from tubes and wires to cameras and cabinets.

The molten metal? No! It was melted in a furnace lined with high temperature Norton refractory cements.

The man? No! Whenever he eats, dresses, shaves, sleeps, or plays, Norton and Behr-Manning products are his unseen aids.

The monument? No! Stone for monuments and buildings is shaped and finished with Norton and Behr-Manning abrasives and grinding wheels. The lettering, too, is carved by Norton abrasives blasted through nozzles lined with Norton (NORBIDE*) boron carbide — the hardest material made by man.

The stranger in the picture is the fish . . . but only until he grabs the abrasive-finished lure. Remember . . . any man-made product . . . whether of metal, wood, paper, cloth, leather, ceramics or plastics . . . depends on abrasives, abrasive products, refractories and grinding machines that bear such well-known trade-marks as Norton and Behr-Manning . . . world's largest manufacturers of abrasives and abrasive products.

*Trade-Mark Reg. U. S. Pat. Off. and Foreign Countries.

NORTON *Making better products to make other products better* BEHR-MANNING

NORTON COMPANY
MAIN OFFICE AND WORKS
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ABRASIVES • GRINDING WHEELS • REFRACTORIES
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THE TECHNOLOGY REVIEW, July, 1951. Vol. LIII, No. 9. Published monthly from November to July inclusive at Emmett Street, Bristol, Conn. Publication date: twenty-seventh of the month preceding date of issue. Annual subscription $3.50; Canadian and Foreign subscription, $4.00. Entered as second-class matter December 23, 1949, at the Post Office at Bristol, Conn., under the Act of March 3, 1879.

COMMERCIAL EQUIPMENT

Designed and Built to Exacting Specifications

Over the years, the National Company has been called upon by the government and industry to design and build radio and electronic equipment for specialized purposes. National engineers have met this challenge by producing equipment that, in all cases, has *more than met* the most exacting specifications . . . equipment that is operating dependably today all over the world. A few examples are illustrated at the right.

If you use or need similar equipment, why not write National today for further information. Address inquiries to the Commercial Division.

National

NC

EST. 1914

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MALDEN, MASSACHUSETTS

EXPORT INQUIRIES on all National products — television, communication receivers, commercial equipment and components — should be addressed to Export Div., Dept. HB.

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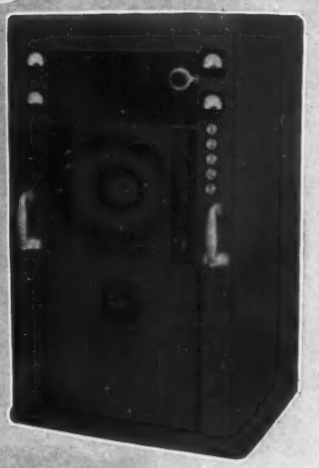
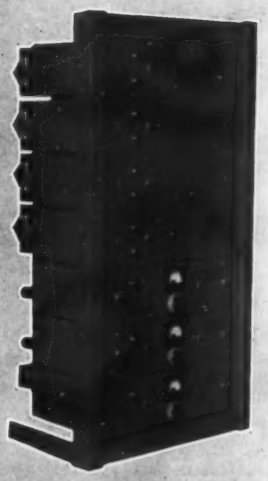
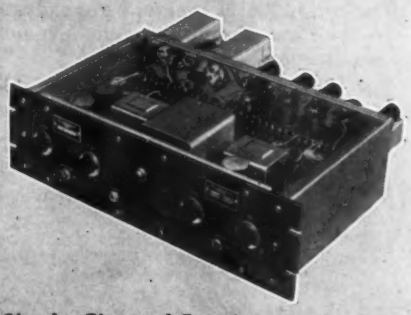


VHF Transmitter



Frequency Shift Equipment



Single-Channel Receiver

IN PEACE OR WAR

CARBON BLACK FOR DEFENSE

Carbon black triples the usefulness of any rubber product that must stand up to the terrific pounding and abrasion that is the normal life of a tire and most other rubber products used in modern warfare. In fact, you cannot build a modern truck, tank, gun carriage, airplane or even a battleship without rubber reinforced with carbon black.

There is no adequate substitute for carbon black and that's why in 1945, it was Number One on the list of Critical War Material Shortages. Since it is essential to the conduct of war, it is equally important to defense.

Military men alone know how vital is the dependability of a product to the lives of numbers of men. That's why Cabot Carbon Blacks are preferred to all others. Manufactured to rigid, high standards, they are guaranteed to give the same, quality performance, time after time.

Weapons of defense or war—whatever the circumstance or purpose—give the best possible length and kind of service, when rubber is reinforced with a Cabot Carbon Black.

GODFREY L. CABOT, INC.

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The World's Largest Manufacturer of Underground Mining Equipment...the Pioneer in Modern Mechanized Mining Methods

Continuous Miners . . . Coal Cutters . . . Loaders . . . Shuttle Cars . . . Belt, Chain and Shaker Conveyors . . . Slushers . . . Rock and Core Drills . . . Fans . . . Blowers . . . Hoists . . . Miscellaneous Mining Equipment.

JOY also builds the most modern line of portable and stationary compressors available for general industrial, mining, quarrying, and construction needs.

JOY MANUFACTURING COMPANY

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PLANTS AND REPRESENTATION THROUGHOUT THE WORLD

Among the JOY executive personnel, we are proud to number the following men who are graduates of the Massachusetts Institute of Technology

James Andrew DRAIN '26
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Galt, Ontario, Canada

George Walter BERGMAN '27
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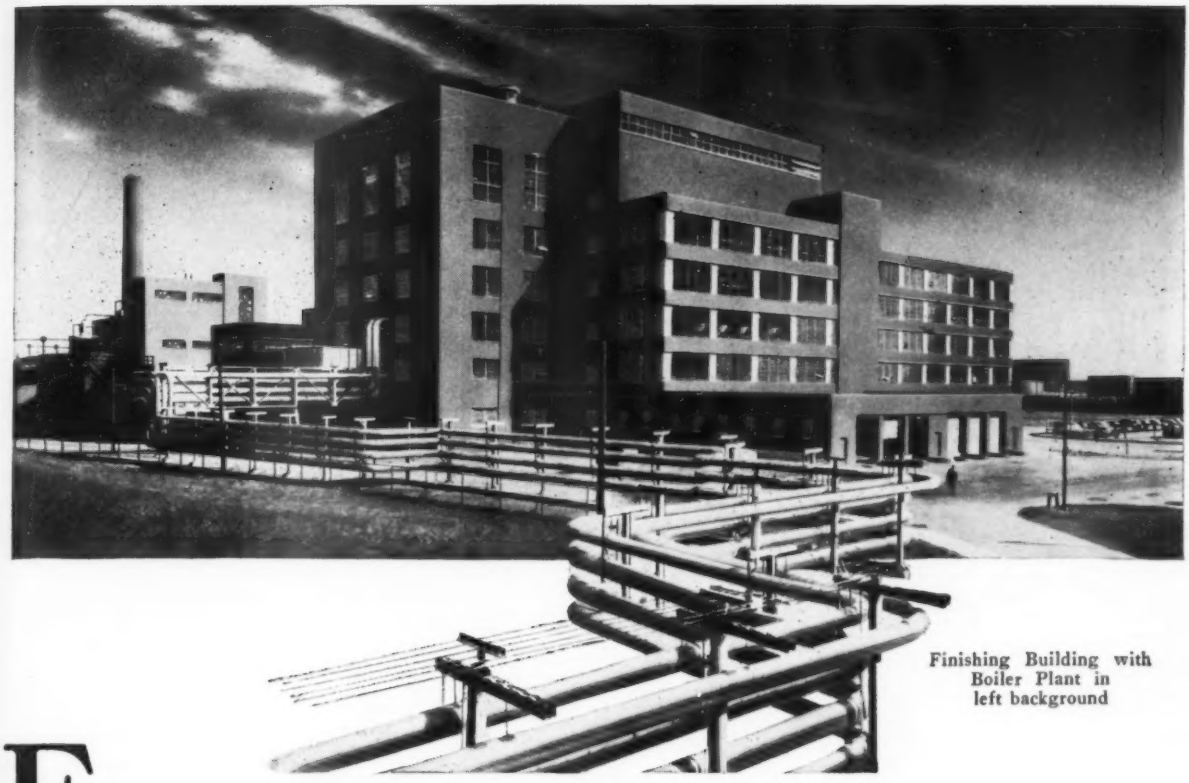
Knoxville, Tenn.

Benjamin Philbrick LANE '23
Special Representative, Export Department
New York, N.Y.

Raymond MANCHA '26
Vice President
Ventilating Equipment
Pittsburgh, Pa.

Robert Wesley SCOTT '23
Production Manager
Air Compressors
Michigan City, Indiana

Jonathan A. NOYES, '12
District Manager
Dallas, Tex.



Finishing Building with Boiler Plant in left background

FROM REPORTS . . . *to Producing Plant*

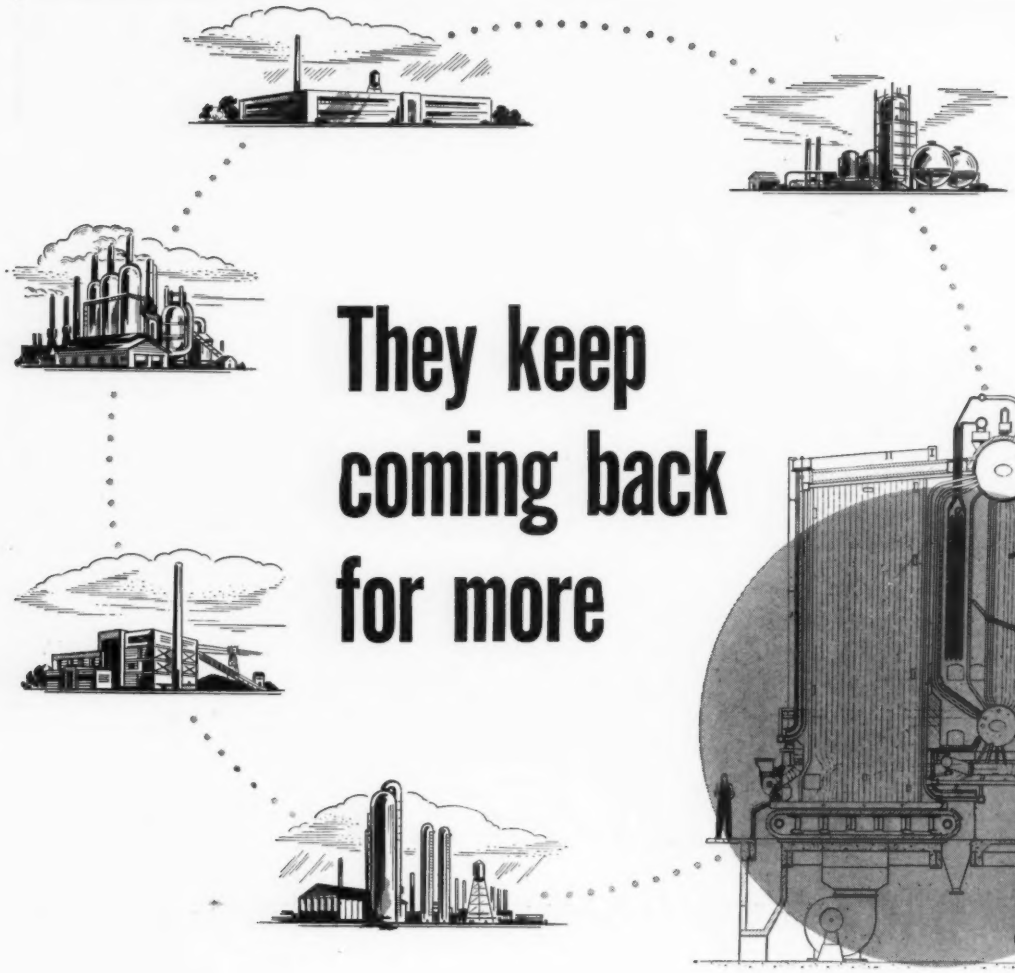
For Lever Brothers Limited, Stone & Webster Engineering Corporation prepared a series of reports covering alternative plans for consolidation and expansion of the company's manufacturing facilities in Toronto.

The resulting new plant facilities, selected to achieve more efficient and economical operation, were designed and constructed by Stone & Webster Engineering Corporation.

Left to right, Boiler Plant, Glycerine Refinery and Finishing Building which includes manufacturing equipment for soap products and toilet preparations.

STONE & WEBSTER ENGINEERING CORPORATION

A SUBSIDIARY of STONE & WEBSTER, INC.



They keep coming back for more

One thing that distinguishes a boiler from most other types of equipment is that its *annual* operating cost is more than its initial cost. In fact, the annual cost of *fuel alone* for the average boiler installation usually *equals* or *exceeds* the purchase price — and the purchase price of a boiler represents a sizable capital investment.

With fuel costing what it does today, it is more important than ever before to select a boiler that will assure the most efficient performance possible. That is why it is especially significant that people who have bought C-E Vertical Unit Boilers — and know these boilers *through their own experience*—continue to buy them.

Just glance at the examples at the right. It's just a small sample of the plants — in industry after industry — that have ordered and *reordered* **VU** Boilers.

Why not investigate the **VU** Boiler for *your* next installation. Our recommendations as to the most suitable type of **VU** Unit for your particular requirements are available to you or your consultants without obligation.

A Chemical Company ordered two VU Boilers in 1939. In 1946 five more were ordered for three of their other plants. In 1949 two more were ordered for one of these same plants, and in 1950 two more units for a fifth plant. In 1951 three more units were ordered for still another plant — thirteen units for six plants in twelve years!

A Steel Company now has a total of eleven VU Boilers in four different plants. Starting with three units in 1936, it has reordered three times . . . most recently in the fall of last year with an order for three more units.

A Textile Manufacturer ordered two VU Units in 1936. Another unit was installed in 1940 and a third in 1944. Still another textile company installed one unit in 1945, a second in 1949 and has just ordered another.

An Electric Utility Company installed its first VU Unit in 1941. Two more units were ordered for another plant in 1947, a unit for a third plant in 1946 and still another for a fourth station in 1949.

A Refining Company ordered one VU Unit in 1937, another in 1940 and another in 1949 for one of its plants; also two in 1942 and one in 1947 for another plant. B-486

ALL TYPES OF STEAM GENERATING, FUEL BURNING AND RELATED EQUIPMENT

COMBUSTION ENGINEERING — SUPERHEATER, INC.

Combustion Engineering Building
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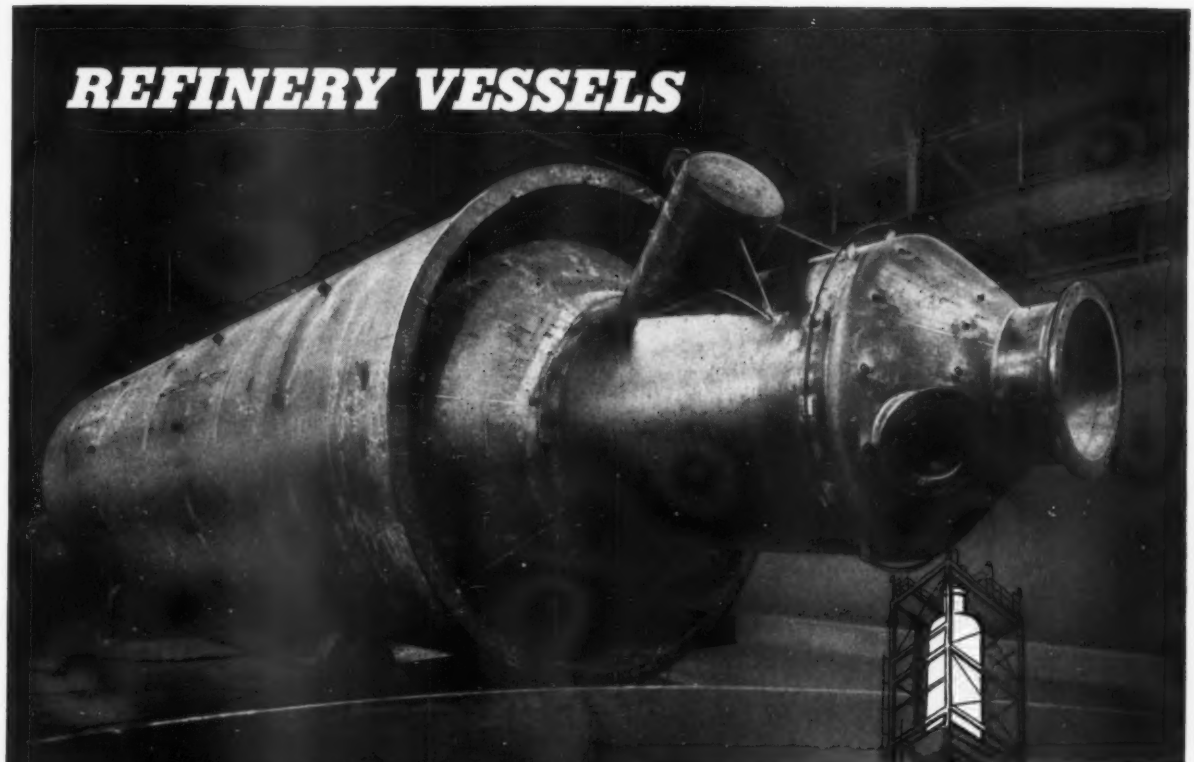
REFINERY VESSELS



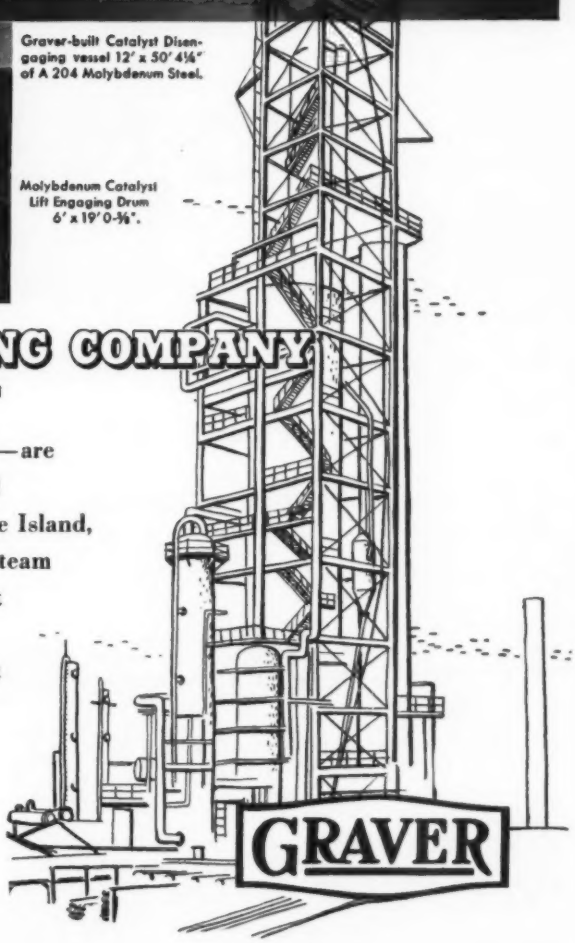
Graver-built Catalyst Disengaging vessel 12' x 50' 4¼" of A 204 Molybdenum Steel.

Molybdenum Catalyst Lift Engaging Drum 6' x 19' 0-⅜".

for GREAT LAKES REFINING COMPANY

DIVISION OF PETCO CORPORATION

Fabricated by Graver—among other tanks and vessels—are two refinery vessels of ASTM A 204 molybdenum steel for Great Lakes' new 6,000 b/d Houdriflow unit at Blue Island, Illinois. Since Graver's vessels function as part of the steam catalyst lift, the special steel provides great strength at the high temperatures required by the process.
These fabrications are typical of the unusual skills that Graver possesses in stainless, alloys and clads, both in its shop work and in field erections.



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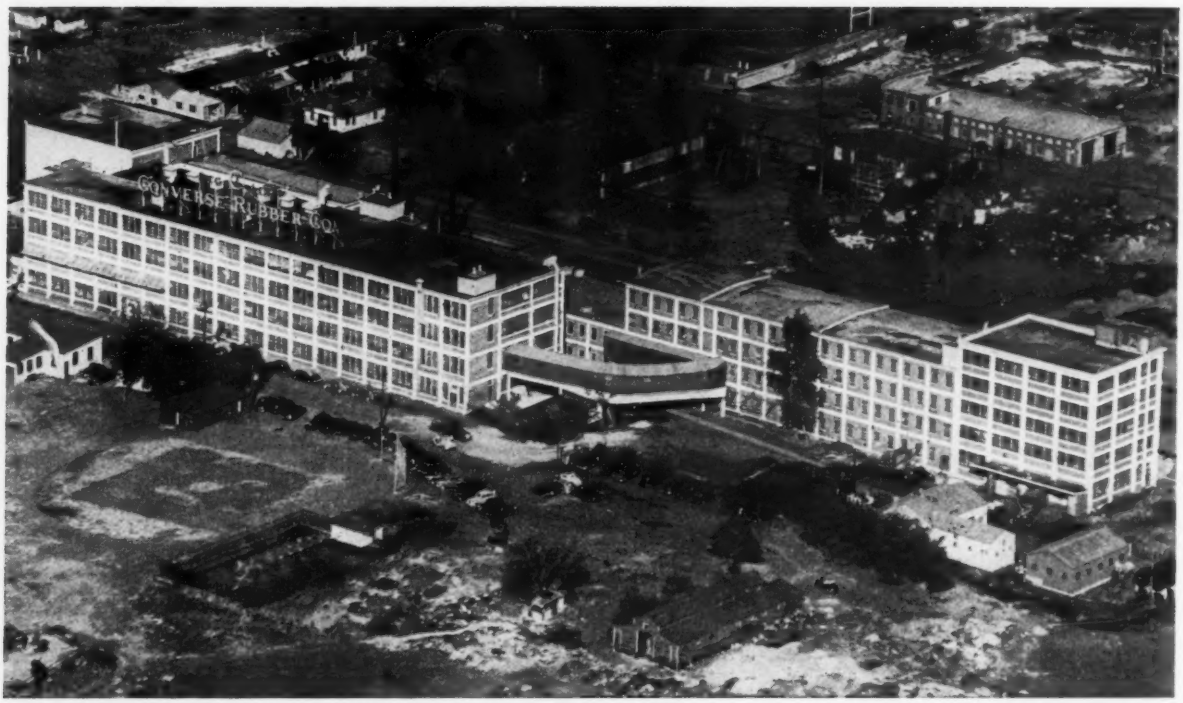

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CONVERSE RUBBER COMPANY

Malden 48, Massachusetts

A. H. WECHSLER '21
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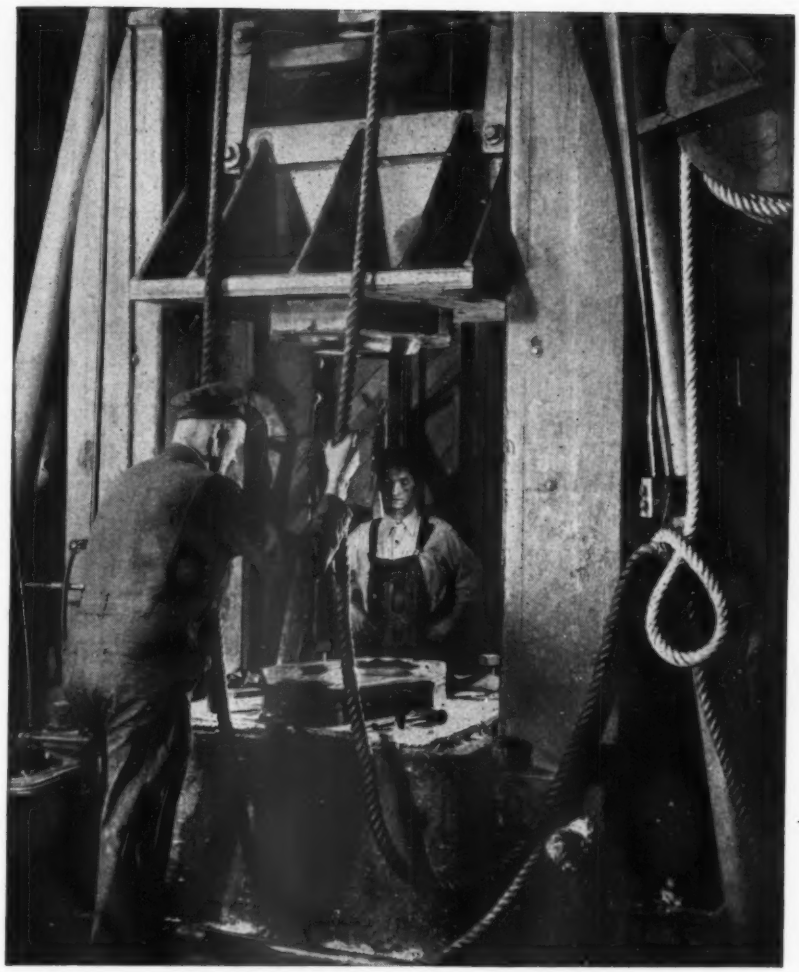


IT TAKES ROPE TO BUILD A BOMBER

Plymouth rope and drop hammers like this are an indispensable work team in many defense plants. Together they stamp out thousands of vital sheet metal parts for aircraft and other military equipment.

To give metal fabricators a more dependable and safer control rope, Plymouth developed a special type of SHIP BRAND Manila that works smoothly and efficiently, hour after hour without burning on the drum.

Plymouth research, engineering, and manufacturing skills together have successfully solved special and standard cordage problems for 127 years. If rope or twine is an important cost item in *your* business, it will pay you to consult a Plymouth representative.

PLYMOUTH CORDAGE COMPANY
377 Court Street, Plymouth, Mass.

PLYMOUTH
Cordage Products

Send for 16-page booklet, "The Plymouth Story" —an illustrated description of what it takes to make good rope and why Plymouth costs less to use.

ROPE AND TWINE FOR MARINE AND INDUSTRIAL USE

It Takes Rope, Too...

To Catch A Cake of Soap . . . Plymouth-made Nylon Foregoers—stronger yet lighter and longer harpoon lines—are favored by whalers in spearing Moby Dick, source of oil for soaps and lubricants, for fertilizer, kennel foods, vitamins.

To Make A Telephone Connection . . . Linemen and Plymouth Rope are an inseparable team in installing and maintaining overhead wires to carry your voice . . . to light your lamps, make your toast, operate your television set. Plymouth developed "Storm-line," a specially treated rope that linemen can trust longer whether it is in use or idle.

To Run the Greatest Show on Earth . . . From Madison Square Garden to the smallest small-town lot, the circus couldn't go on without rope. From the man on the flying trapeze to the hundreds of jobs of hauling and securing the Big Top itself, Ringling Brothers and Barnum and Bailey alone use 70 miles of Plymouth Rope each year.

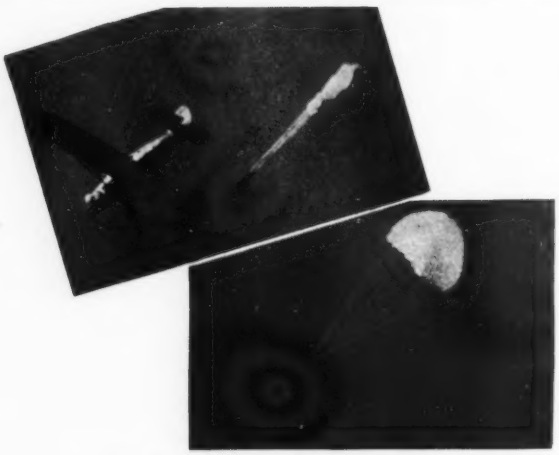
To Provide Your Toast for Breakfast . . . Grain is scooped from ship holds by huge shovels. Plymouth Shovel Lines are attached to these giant scoops and work by pulleys back and forth from hold to elevators. These lines move tons of grain every year . . . for your cereal, bread, fodder for livestock.

To Bring You Your Morning Newspaper . . . Wet sheets of paper traveling over steamheated drums are sped on their merry way with the help of Plymouth Sheehan Carrier Rope. A light transmission rope, it takes plenty of punishment on its up and down route over continual and intense heat.

To Make You a Suit of Clothes . . . Rope is an obedient servant in textile mills. Mule spinner drive rope, rim banding, spindle banding, knife rope and loom rope are typical jobs Plymouth Rope performs in woolen and cotton mills. Plymouth-developed textile mill ropes were engineered to meet the hard wearing requirements of mills.

ELASTIC SHOCK and EXERCISER CORDS

We supply the aircraft industry with Elastic Shock Cord and Elastic Exerciser Cord produced in various sizes to meet the military specifications of the U.S government.



ELASTIC SHROUD LINES

Developed by Robert Taylor Dawes (M.I.T. 1926), this elastic shroud line quickly takes up the shock of the opening parachute, even though the paratrooper bails out from a plane going at high speed. Landing shock and oscillation are markedly reduced, and a 'chute shrouded with these elastic lines spills its air automatically, minimizing the drag along the ground. It affords fliers greater safety in emergency jumps, and increases their efficiency

DAWHIDE BETTER-THAN-RAWHIDE LACES

Dawhide "better-than-rawhide" Laces are tough, long-wearing, non-slipping, fabric laces that have been chemically treated and scientifically impregnated to become water-resistant and non-freezing. Dawhide Laces are ideal for active sport and rugged work shoes, and were used on the Byrd Expeditions to the Antarctic for lacing boots and lash ropes for pack sleds, tents, etc. Dawhide Laces were invented by and named for Robert Taylor Dawes, M.I.T., 1926

By Invitation Member
Emblem of BUSINESS CHARACTER
Rice Leaders of the World Association
Represents High Standing in NAME-PRODUCT-POLICY

WE DEVELOP SPECIAL ITEMS OF NARROW ELASTIC AND NON-ELASTIC BRAIDS AND WEBBING FOR CIVILIAN, INDUSTRIAL AND MILITARY USES.

WE HAVE FACILITIES FOR SPECIAL DYEING AND TREATING PROCESSES

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ROBERT TAYLOR DAWES
Class of 1926

Reinforced Edge
SHOCK CORD
SIZED 1864
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ROBERT LOWELL PHIPPS
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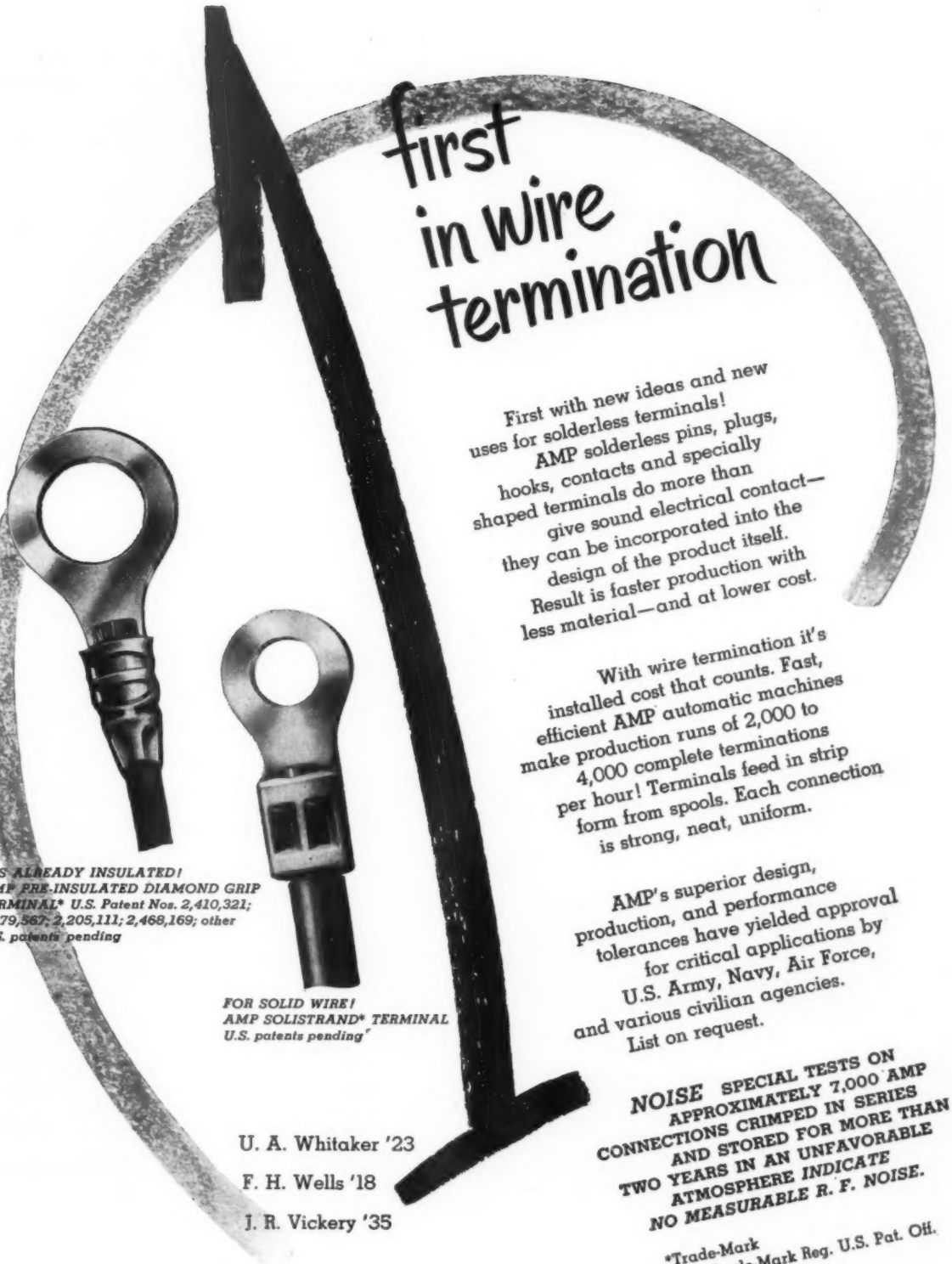
first in wire termination



First with new ideas and new uses for solderless terminals! AMP solderless pins, plugs, hooks, contacts and specially shaped terminals do more than give sound electrical contact—they can be incorporated into the design of the product itself. Result is faster production with less material—and at lower cost.

With wire termination it's installed cost that counts. Fast, efficient AMP automatic machines make production runs of 2,000 to 4,000 complete terminations per hour! Terminals feed in strip form from spools. Each connection is strong, neat, uniform.

AMP's superior design, production, and performance tolerances have yielded approval for critical applications by U.S. Army, Navy, Air Force, and various civilian agencies. List on request.

IT'S ALREADY INSULATED!
AMP PRE-INSULATED DIAMOND GRIP TERMINAL U.S. Patent Nos. 2,410,321; 2,379,567; 2,205,111; 2,468,169; other U.S. patents pending*

FOR SOLID WIRE!
AMP SOLISTRAND TERMINAL*
U.S. patents pending

U. A. Whitaker '23
F. H. Wells '18
J. R. Vickery '35

NOISE **SPECIAL TESTS ON APPROXIMATELY 7,000 AMP CONNECTIONS CRIMPED IN SERIES AND STORED FOR MORE THAN TWO YEARS IN AN UNFAVORABLE ATMOSPHERE *INDICATE NO MEASURABLE R. F. NOISE.***

*Trade-Mark
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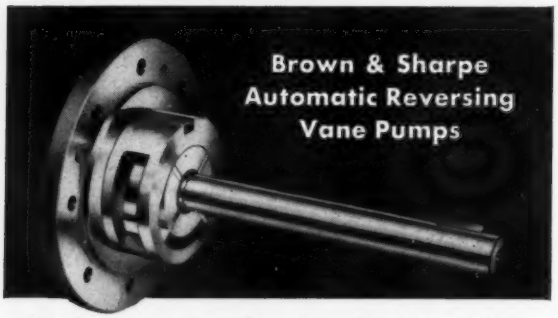
AMP

AIRCRAFT-MARINE PRODUCTS INC.
2100 Paxton Street, Harrisburg, Pa.

Adaptable Pumps for "BUILT-IN" Use



Here's your ready-made answer to machine design problems involving individual lubrication of machine units. Brown & Sharpe Automatic Reversing Vane Pumps offer simplified design that assures easy accommodation to varied applications. Automatic feature maintains same direction of flow when rotation is reversed.

Stripped models available both with and without housings in three sizes: 2½, 5, and 11½ gpm at 0 lbs. pressure and at 1140 rpm. Write for complete catalog. Brown & Sharpe Mfg. Co., Providence 1, R. I., U.S.A.

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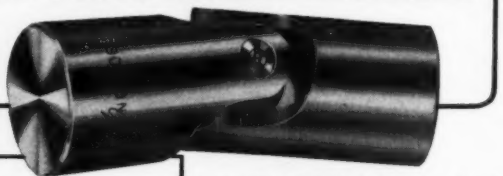
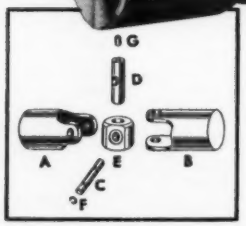
ALL PARTS INTERCHANGEABLE





Bearing Pins (C & D) hardened and precision ground.

Center Bearing Block (E) hardened and precision ground. Holes intersect accurately.

Self-Locking Assembly Ring (F) snap locks into recesses in small bearing pins and center bearing block.

Self-Closing, Ball Valve Oiler (G) provides oil reservoir for safe, sure lubrication.

Yokes (A & B) of heat treated alloy steel with bearing surfaces precision ground and O. D. ground to +.000, —.001.

Boston Gear Universal Joints Are Stocked by 80 Authorized Distributors — One Near You.

For complete information on stock sizes, HP ratings and breaking loads, see Boston Gear Catalog No. 55. Free copy mailed on request.

BOSTON GEAR WORKS
72 HAYWARD ST., QUINCY 71, MASS.

THE TABULAR VIEW

Fundamental Knowledge. — In the future, the nation will need to build technological progress on the foundations of two strong pillars, in the opinion of ALFRED P. SLOAN, JR., '95, chairman of the board of the General Motors Corporation. Mr. Sloan believes (page 469) that one of these requirements is the development of fundamental knowledge, in the social as well as the natural sciences, by educational institutions free from undue financial stress and governmental domination. The second requirement is the development of technically trained personnel to assume positions of enlightened leadership in the management of industry. As a means of implementing such a program of mutual co-operation between education and industry, Mr. Sloan suggests "that corporate enterprise should support the sources out of which flow fundamental knowledge, and do it in its own self-interest as a sound business investment." The Institute's new School of Industrial Management is living proof that Mr. Sloan practices what he preaches.

Need for Unity. — At the Victory Dinner in New York on May 3, PAUL G. HOFFMAN, formerly administrator for the Economic Cooperation Administration, made a strong plea for unity against the forces of oppression and aggression. The speech, delivered during the height of public interest in the removal of General MacArthur from his command, is published (page 473) at the time when a Soviet "peace" feeler marks the anniversary of the Korean war. For this reason, perhaps, Mr. Hoffman's message has double significance. Mr. Hoffman has recently become director of the Ford Foundation, whose primary objective is to enable men to live together in good will.

Character Building. — In his commencement address before members of the Class of 1951, the Honorable HAROLD R. MEDINA draws upon his extensive teaching and legal experience to emphasize (page 476) the thought that "the qualities which are most valuable in any profession are the ones which cannot be bought at any price." Well known in the legal profession as an able lawyer, teacher, and author, he was appointed judge of the United States District Court, Southern District of New York by President Truman. Judge Medina won international acclaim for his patience and impartiality while presiding over the trial of 11 Communists charged with conspiracy to teach overthrow of the United States Government by force and violence. He has recently been named by President Truman to succeed Learned Hand in the United States Court of Appeals for the Second Circuit.

Tradition and Progress. — In delivering the baccalaureate address to the graduating class, the Reverend SIDNEY LOVETT, chaplain of Yale University, makes ample recognition of man's achievements in technology. Yet, Dr. Lovett reminds us (page 479) that even the greatest of progress in the physical sci-

(Concluded on page 450)

Thinking of improving

"Improving" any machine really means increasing its productive capacity. That means tinkering with speeds and weights and strength—ending up with alloy steels.

Which alloy steel?—the one that meets physical requirements at the lowest cost. Molybdenum steels fill that bill. Good hardenability, plus freedom from temper brittleness, plus reasonable price enable them to do it.

Send for our comprehensive 400-page book, free; "MOLYBDENUM: STEELS, IRONS, ALLOYS."

CLIMAX FURNISHES AUTHORITATIVE ENGINEERING DATA ON MOLYBDENUM APPLICATIONS

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Special Tube Section

55 Chapel St., Newton, Massachusetts

THE TABULAR VIEW

(*Concluded from page 448*)

ences has little meaning "if we cannot tell the difference between right and wrong in terms of our personal conduct." Dr. Lovett is no stranger to Technology groups, having been pastor of the Mount Vernon Church, directly across the Charles River from M.I.T., between 1919 and 1932. He has been chaplain at Yale University since 1932.

Today's Graduates. — In his farewell address to the Class of 1951, Technology's President, JAMES R. KILLIAN, JR., reminds this year's 1,178 graduates (page 481) that the nation "desperately needs engineers and scientists who not only can increase our standard of living but also can increase our standard of living together; men who have the courage and understanding to tackle the overriding human problems of today." In the celebrations which commencement day, 1951, occasions, President Killian, as a member of the Class of 1926, also celebrates the 25th reunion of his own graduation from the Institute. Moreover, his own activities exemplify the service in the humanities and the social sciences which he calls for from those who have completed their studies.

Alumni Day. — For those who were unable to attend Alumni Day, 1951, and for those who would relive their reunion in Cambridge from the printed word, an account of all events (except the semi-private reunions of individual classes) appears on page 483.

The Review is not published during the summer months following July. This issue, therefore, concludes Volume 53. Number 1 of Volume 54 will be published on October 26 and dated November. Readers who bind their copies are reminded that if they possess nine issues of Volume 53, their files are complete. An index to the volume will be ready on September 14 and will be supplied post free upon request.

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When oil is sold from one of these tanks its average temperature must be known in order to compute the true amount. But accepted methods of checking temperatures leave much to be desired. Even in heated tanks, temperatures are far from uniform. The oil is cold below the coils, hot around and immediately above, progressively cooler near the top. To obtain an average, a gauger had to climb the tank in all kinds of weather, and spend up to an hour taking dip-cup thermometer readings at many levels.

Even with great care, this method could introduce errors in volumetric calculations amounting to hundreds of barrels per tank. Needed: an instrument to instantly indicate true, average temperature throughout the liquid.

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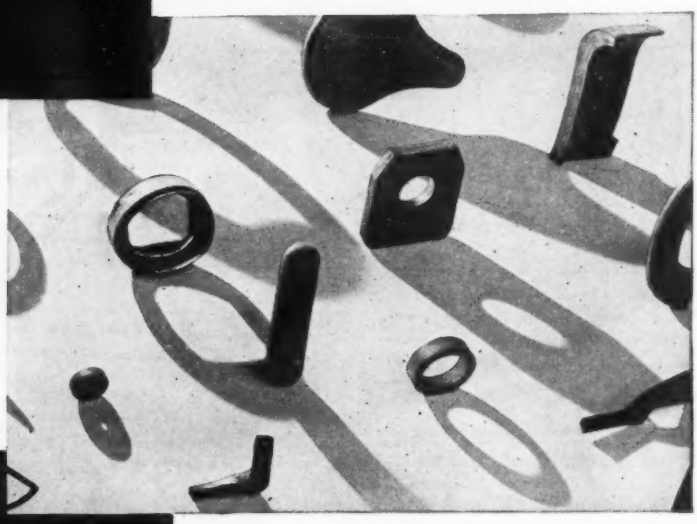

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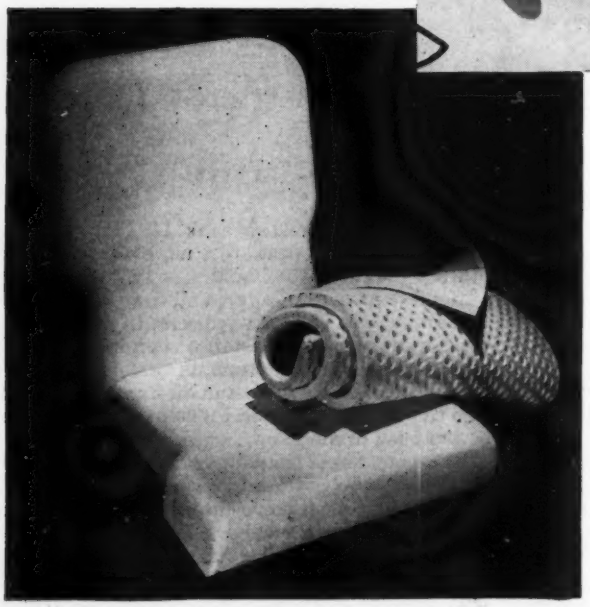

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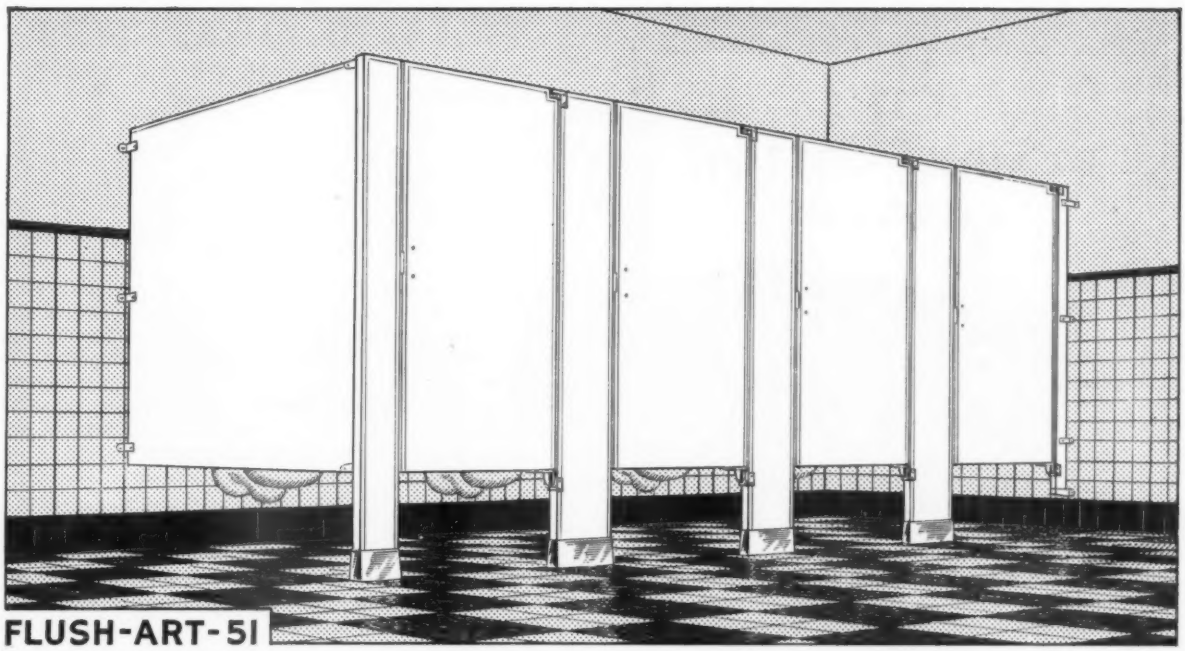

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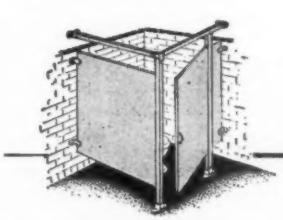

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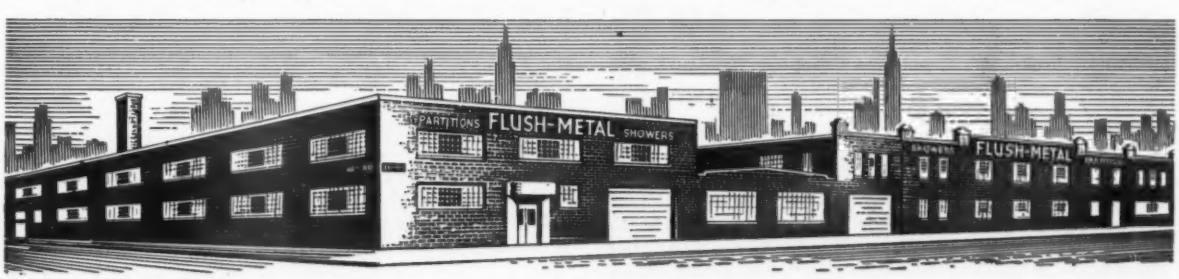

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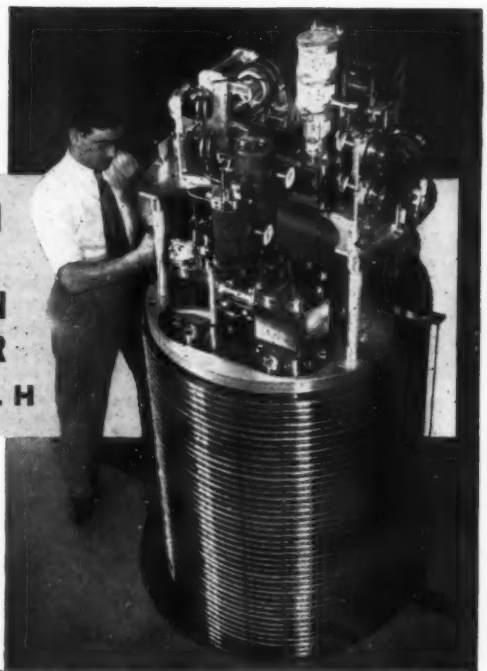
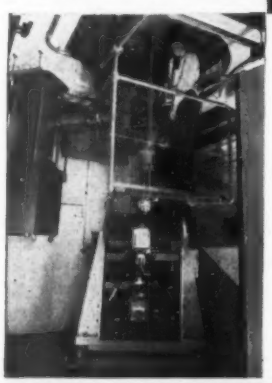


A New Energy Range for Precision Research

Terminal assembly showing positive-ion source components.

Tube-extensions, vacuum pumps, and magnetic analyzer of beam.



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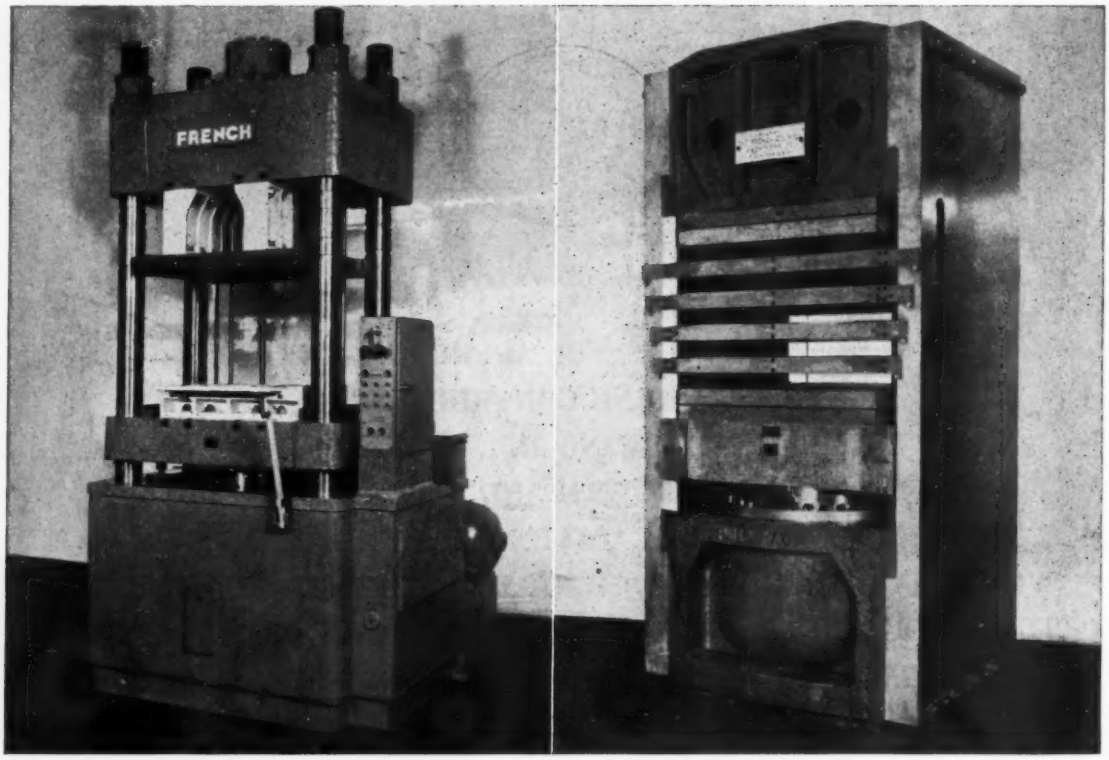

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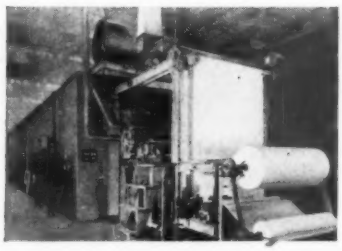

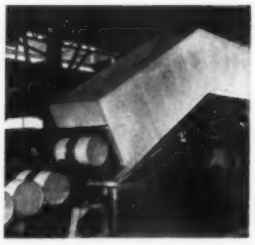

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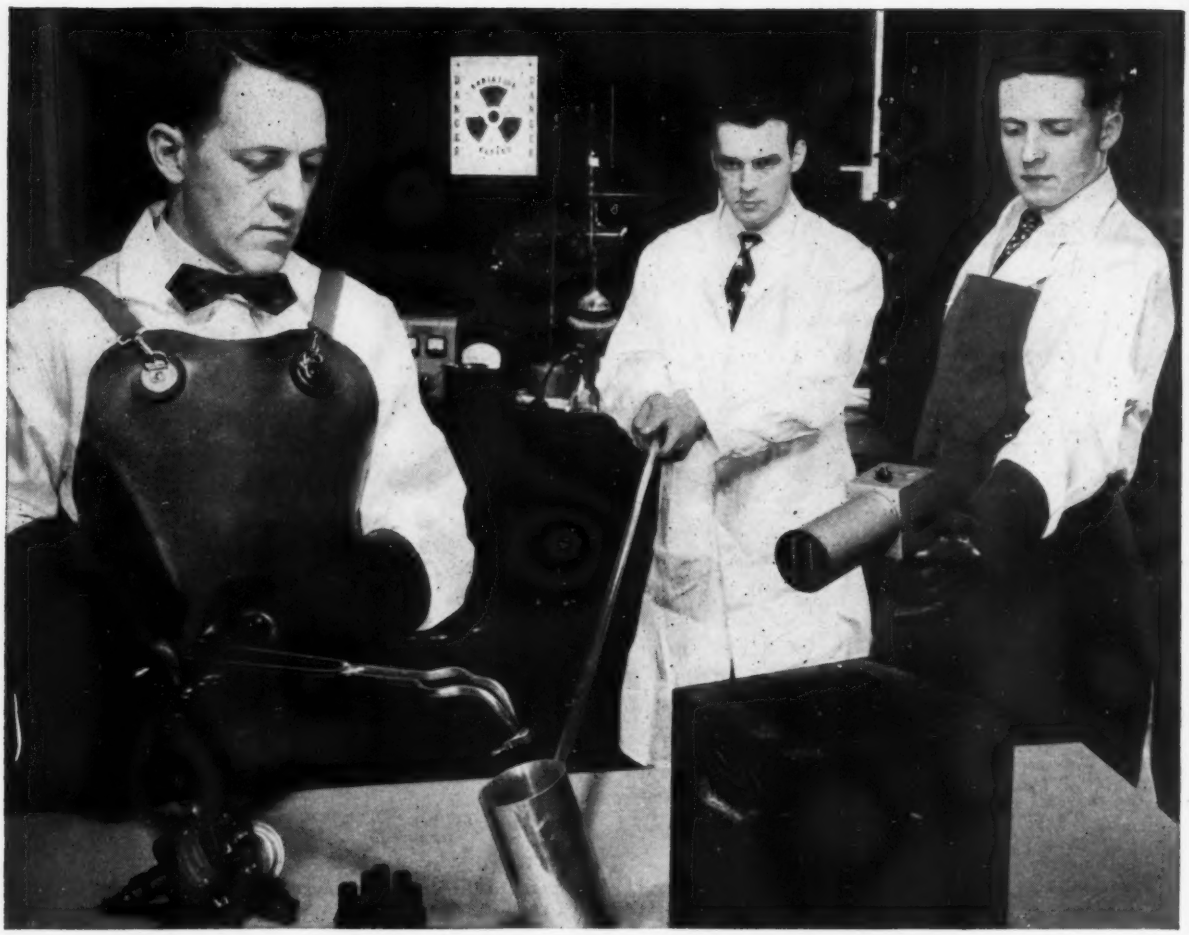

In this "Radioactive Materials Room" at Chrysler Laboratories, many stronger metals . . . better designs . . . smoother-running, longer-lasting parts have their beginning. Note the protective lead-and-rubber gloves and aprons, and the thick lead box in the foreground where "hot" parts are safely stored.

ATOMS FROM OAK RIDGE COME TO DETROIT

The men in the picture are handling "hot" or radioactive automobile parts. That's the reason for their long-handled tools, the radiation exposure meter held by the man at the right—and their caution. It's all part of a new kind of research at Chrysler Corporation.

Our engineers send engine distributor points to the U. S. Atomic Plant at Oak Ridge, Tenn., where they are made radioactive in the famous Atomic Pile.

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TWIN-JET ENGINE gives pure jet thrust for Douglas F3D "Skyknight" (second).

TURBO-PROP ENGINE combines speed and endurance for Douglas A2D "Skyshark" (third).

RECIPROCATING ENGINE provides work-horse efficiency for Douglas AD "Skyraider" (bottom).

Experience with all four modern types of power for aircraft in one manufacturing plant is unique. Yet Douglas has that experience as the result of prudent, peace-time planning with the Navy.

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In 1950 the twin-jet F3D Skyknight was started down the production line at El Segundo.

Now being flight tested in preparation for line production is the A2D Skyshark, turbo-prop attack plane. And above Edwards Air Base the rocket-powered D-558-2 Skyrocket seeks scientific data to help build newer aircraft of classified status.

By manipulating the design, development and production of these power types, the Navy and Douglas have arrived at a flexible, "balanced power" position from which our air strength can be increased swiftly. Douglas Aircraft Company, Inc.

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More car owners the world over ride on Goodyear tires than on any other kind. *Doesn't it stand to reason that the tire that gives the most people the greatest satisfaction is the tire for you to buy?* (Above: Cathedral, Taxco, Mexico)

More people ride on Goodyear tires than on any other kind

Super-Cushion by GOODYEAR

Super-Cushion, T. M.—The Goodyear Tire & Rubber Company, Akron, Ohio

Technology Review Photo

THE TECHNOLOGY REVIEW

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EDITED AT THE MASSACHUSETTS INSTITUTE OF TECHNOLOGY

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The Trend of Affairs

Wanted: Engineers and Scientists

REVIEWING the nation's shortage of competent engineers and scientists, Karl T. Compton, chairman of the M.I.T. Corporation, told members of a symposium on "Hydrodynamics in Modern Technology" at the Institute that "we are in an extremely bad situation" because of the drop in current engineering enrollment in colleges and universities. At a dinner meeting on June 4, Dr. Compton said:

All evidence is that engineering is a rapidly growing profession. Each year since the war this growth has been greater than any estimates have predicted. I see no likelihood that good men graduating from engineering schools in the coming years will fail to find interesting and challenging work.

The most important of our contributions in this new [hydrodynamics] laboratory will be the education of young hydrodynamicists to assume the new responsibilities in this rapidly growing field of technology.

Speaking of the shortage of scientific and engineering man power, Dr. Compton said that from a peak of 50,000 in 1949 the number of graduates from engineering schools throughout the country will decline to 32,000 in 1952, 22,000 in 1953, and 12,000 to 17,000 in 1954. Estimates place the need for engineering graduates at 30,000 to 40,000 per year throughout this period.

Even this spring, he said, we were faced with a very definite deficit in engineers. The demand for some types of scientists and engineers is described as hysterical, and it is high in all scientific and engineering fields. "The most important single thing that can be done to help remedy this situation," Dr. Compton urged, "is to correct the impression that we are oversupplied with engineers."

◀ *Members of the Class of 1951 entering Walker Memorial to attend baccalaureate service in Morss Hall.* *M.I.T. Photo*

No Brush-Off

THAT brushes are an integral part of present-day life may be demonstrated by considering merely the first hour of the morning. From bed we arise onto a carpet that is brushed with a carpet sweeper, step across a wooden floor that was varnished with a brush, thence to bathroom tiles that were cleaned with a scrub brush. We brush our teeth and hair, lather our face with a shaving brush. The baker's bread for our breakfast toast was made in a pan that probably was greased with a brush before use, and scrubbed clean with a brush afterwards. While dressing we whisk the lint off our clothes, and touch up the shine on our shoes with a brush. Then, as we emerge into the fresh morning air, we encounter neighbors sweeping off their sidewalks.

But despite its commonplace familiarity, the brush embodies a striking paradox. For it serves two diametrically dissimilar purposes: either to apply, or to remove, materials. The removing action of brushes depends in part upon a whisking or flicking effect of the fibers, and partly upon scrubbing or abrasive action. The brush is useful in applying materials, as in painting, because it can hold viscous fluids among its fibers.* A third characteristic of brushes that underlies their value in both removal and application uses is flexibility of the fibers, which effects adaptation to irregularities in surfaces to which brushes are applied.

The simple and obvious nature of the brush apparently made it one of mankind's earliest tools. Brushes that are merely bundles of twigs, or hairs, tied together have been found among the relics of early civilizations and of primitive savage man.

*Maximum paint retention by brushes requires a sharply tapered fiber. This is one reason why synthetic bristles have not entirely replaced certain costly natural bristles in paint brushes; as to date synthetic fibers have not been made with as pronounced a taper as some of the natural ones.

But despite its ancient lineage, the brush today seems to be in little prospect of being displaced technologically. Thus, although spraying and dipping are now often used to apply paint or other surface coatings, application by brush remains superior for many types of painting. Similarly, in some localities that prototype of broom wielder, the street sweeper, has been supplanted by huge mobile street-cleaning machines; but nevertheless motor-driven brushes remain the basic functioning part of such machines. Numerous like examples could be cited to show that the primitive, paradoxical brush is firmly entrenched within our contemporary scene.

Precision Tachometers

In numerous military and industrial control applications, tachometers have important uses. In addition to their obvious application of merely indicating rotational speed, tachometers may be used as velocity feed-back elements in computing machines, in automatic pilots for planes and missiles, in automatic fire-control mechanisms, or in the mechansims for controlling radar antennas. For some applications, tachometers are used under conditions requiring a high degree of accuracy. The Dynamic Analysis and Control Laboratory has, therefore, been engaged in studies aimed at improving tachometer performance, and research has led to noteworthy improvements in one type of tachometer, called the drag-cup alternating-current tachometer.

Essentially, the drag-cup alternating-current tachometer is a two-phase induction generator with a voltage of constant amplitude and constant frequency applied to the winding of one phase. The design is such that, over a substantial range of speed, the winding of the second phase yields another voltage of magnitude nearly proportional to the speed at which the tachometer is driven and phase shift nearly constant with respect to the supply voltage.

Since some of the applications of this type of tachometer require very high accuracy, thorough analysis of all details influencing errors or departures from ideal performance is essential to favorable design and adaptation in a particular situation. Consequently, an extensive analytical and experimental study was conducted by Richard H. Frazier, '23, Associate Professor of Electrical Engineering. Results of this study led to the development of relatively simple and convenient mathematical expressions for tachometer performance in a form readily checked by measurement. The selection of favorable proportions for the electromagnetic parameters in the initial design, and the study of errors as functions of speed, frequency and amplitude of the source of voltage, temperature, and dissymmetry and inhomogeneity of parts was consequently greatly facilitated. The influence of the various parameters in determining the magnitude and phase of the output voltage also became more readily evident, so that procedures in calibrating and adjusting the tachometer could be improved.

Over a speed range of from zero to several thousand revolutions per minute, the magnitude of speed errors can probably be reduced to about 0.01 per cent, and errors in phase shift to about 0.01 degree.

Microwave Spectroscopy

Under suitable conditions, all matter absorbs or emits electromagnetic energy in a manner depending upon the frequency with which elementary particles of matter move. The study of the absorption and emission of electromagnetic energy as a function of wavelength is called spectroscopy. The vast amount of data collected by spectroscopists for nearly a century has been instrumental in providing extremely valuable methods of chemical and physical analysis. It has also provided much necessary experimental data by which to test and check the various theories of atomic physics which have been devised.

Originally, studies were made of the bright and dark lines of the visible spectrum, from which spectroscopy derived its name. At a later date, investigations were conducted at the longer wavelengths of the infrared region. With the development during the past decade of new electronic devices capable of producing appreciable amounts of power in the microwave region, spectrographic studies have been extended to still longer wavelengths.

Although certain exceptions can be found for any broad generalizations which might be made, by and large, spectroscopic data at optical frequencies were found to produce information regarding the behavior of electrons within the atom; whereas infrared spectroscopy yielded valuable clues regarding the vibrations of atomic nuclei in matter. Spectroscopic studies have now been extended into the microwave region and are providing much useful information regarding the rotation of atomic particles in gas molecules. In the Research Laboratory of Electronics (an interdepartmental laboratory operated jointly by the Department of Physics and the Department of Electrical Engineering) a group of research workers under the direction of Malcolm W. P. Strandberg, '48, Assistant Professor of Physics, are carrying on investigations in the range of from three millimeters to 10 centimeters.

As a relatively new field for delving into atomic structure, microwave spectroscopy provides means for determining molecular information not readily obtained with optical or infrared spectroscopic means. In addition, however, microwave spectroscopy provides a much greater resolving power than is attainable when the shorter wavelengths are employed.

The program in microwave spectroscopy is being undertaken to determine the extent to which microwaves can be used to yield information regarding atomic and molecular structure. The field is also being investigated to determine how best to manipulate the observed data in an efficient manner in order to provide the most useful information. Finally, the physical properties of certain general types of molecules have been studied theoretically, and microwave spectroscopy has been employed to obtain experimental checks of present theories of the structure and behavior of matter. Certainly microwave spectroscopy will enable us to enlarge our concept of molecular and nuclear structure. But there is also a good possibility that microwave spectroscopy will find use in industrial analysis and control, just as the larger and more mature fields of optical and infrared spectroscopy are doing at the present time.

Sound Approach in Plastics

HIGH-FREQUENCY vibrations of the air may provide a convenient and rapid method of determining a number of important properties of plastics. In the sound approach to the investigation of the properties of plastics, ultrasonics may be used to determine the degree of polymerization or cure. But the method also has been found to have application in providing indication of molecular weights and in making possible the measurement of certain mechanical properties of the plastic. Such properties as energy absorption and moduli of elasticity have been already determined by ultrasonics.

The ultrasonic technique employed in the M.I.T. Plastics Research Laboratory, in research sponsored by the plastics division of the Manufacturing Chemists Association and the Army Ordnance, and conducted under the direction of Professor Albert G. H. Dietz, '32, of the Department of Building Engineering and Construction, is an adaptation of techniques originally developed and used in the Institute's Acoustics Laboratory by Theodor F. Hüter, A. Wilson Nolle, '47, Adone C. Pietrasanta, Jr., '51, and Ira Dyer, '49. Bursts of ultrasonic sound, in the frequency range of 1.5 to 2.5 million cycles per second, are sent through the specimen under investigation, and the time for the signal to traverse the material and the loss of signal strength are both measured. Pulses can be varied from about one to 20 microseconds in duration so that no overlapping of pulses occurs in the material. Accurate determination of the input and output times of the initial points of the pulses is possible, and the time required for the pulse to traverse the specimen can be measured accurately. Precise determination of the attenuation (or loss of signal strength) is also possible. The traverse time is related to the modulus of elasticity of the material, and the attenuation of the signal is a measure of the energy absorption and damping capacity.

In experiments with polyester-type resins, measurements were made of the velocity of propagation and of attenuation of signal during the period when the polyester gradually changed, by polymerization, from a thin liquid to a thick gel, and then to its final hardened state. It was found that the velocity of propagation of the ultrasonic sound increased approximately twofold during polymerization, the change occurring primarily during the gel stage. Attenuation of the signal increased abruptly during the gel stage, becoming some seven times as great during this stage as in the liquid stage, but decreased again to approximately three times the original attenuation when final hardening of the resin occurred. Large differences of behavior were thus found during polymerization.

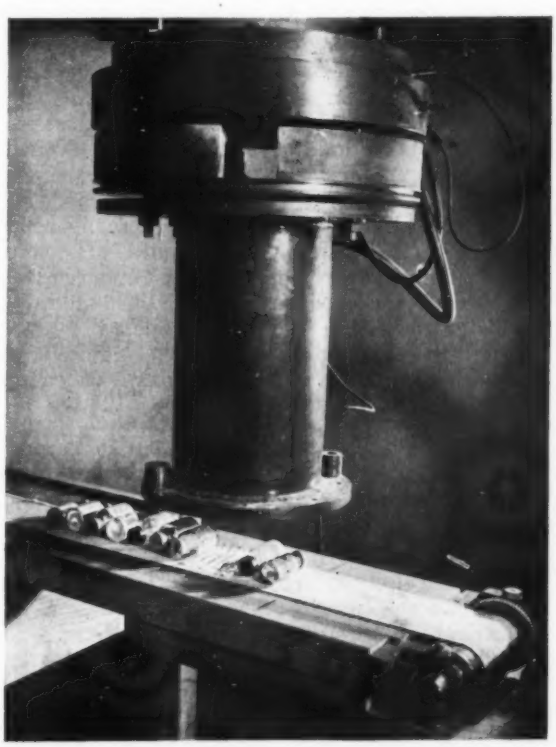
Similar experiments are projected for other types of resins such as phenol and resorcinol formaldehyde which harden or polymerize by condensation or splitting off water as hardening takes place. Experiments with polymerized thermoplastic resins having different average molecular weights indicate that attenuation is related to average molecular weight. Velocity of propagation appears to be the same for all molecular weights, but seems to increase as the temperature is lowered.

Electronic Sterilization

A NEW sterilization method, which acts virtually without heat, promises to have important applications in the medical, pharmaceutical, and food fields. This method has been under study at M.I.T. for some time in a program of research, supported, in part, by the Atomic Energy Commission and the National Institutes of Health, and directed by John G. Trump, '33, Associate Professor of Electrical Engineering, with his associate, Kenneth A. Wright, '47.

Streams of electrons with energies up to four million volts, produced by a Van de Graaff accelerator, are projected through the material to be treated, which is often sealed within its glass or metal container. Sterilization by high-energy electrons is accomplished in less than a second and raises the temperature of the absorber less than 10 degrees F., even when heavily contaminated with radio-resistant organisms. A wide variety of heat-sensitive pharmaceuticals, including the antibiotics, adrenal cortex extracts, and surgical sutures, have now been electron-sterilized in containers without adverse effects.

Studies on blood plasma are being carried out in the High Voltage Research Laboratory of the Department of Electrical Engineering in co-operation with groups at the National Institutes of Health, the Bussey Institute of Harvard Medical School, and the Red Cross. At this time, the effects of high-energy electrons on a variety of viruses are being systematically studied in an effort to predict the effect of cathode rays on the hepatitis virus, a virus which causes jaundice in those



Pharmaceuticals, small food products, and similar items can be sterilized by electron beams even after packaging, since no appreciable temperature rise occurs in the electron process.

who have affected plasma or whole blood. As a result of these studies, within recent months the 37 per cent survival dose has been determined for the poliomyelitis, herpes, mumps, vaccinia, and rabies viruses. The lethal effect of electrons follows an exponential law on both viruses and bacteria, and the dose required to produce complete sterility can be predicted when the characteristic survival dose of these organisms is known.

Concurrent with such studies of the virucidal and bactericidal action of high-energy electrons are studies of the effects of this radiation on other constituents of the absorbing medium. In blood plasma work, studies have been made on the tolerance of such components as prothrombin and fibrinogen, two large protein molecules which are important in the clotting mechanism. Both of these molecules are inactivated by ionizing energy equivalent to 200,000 roentgens when irradiated in the liquid state at room temperature, but show very little loss of activity when given 2×10^6 roentgens equivalent physical (abbreviated rep.) at temperatures near dry ice. The practicability of low-temperature irradiation is one of the attractions of high-energy electrons, which have a maximum penetration of one centimeter in aqueous solutions for each two million volts of energy. It is probable that cathode-ray sterilization of the formed elements in whole blood – the red cells, white cells, and platelets – can also be accomplished, and studies are now being started with this purpose in mind.

The protective action of low-temperature irradiation, as well as the introduction of protective agents, is another aspect of high-energy electron studies. Simple molecules, that is, those with molecular weight under a few thousand, tolerate many times the sterilizing dose without detectable effects. The more complex molecules, such as the two proteins previously mentioned, tolerate 2×10^6 rep. when in the dry state, but are affected in aqueous solution, unless at low temperature, because of the transfer of ionization energy from the water molecules. The fundamental action of high-energy electrons in destroying micro-organisms begins with the excitation and ionization of some of the constituent atoms within the living organism, followed by chemical changes which, in the limit, result in their demise. Energetically considered, electron sterilization is far more efficient than heat, since it accomplishes its mission by affecting directly only a few molecules within the organism.

Ultraviolet light and nitrogen mustard, as well as high-energy electrons, are being investigated for their sterilizing actions and clinical proof of these methods is now, for the first time, being made on human volunteers. Of all of these methods, the high-energy electron approach appears to possess clear advantages because the electrons irradiate the material uniformly and with accurately controlled doses, because of the effectiveness of electrons on aqueous solutions at reduced temperatures as well as in dry form, and because Van de Graaff accelerators can be used in this method to sterilize large quantities of material economically on a production-line basis. This final advantage is particularly important in the pharmaceutical industry since sterilization can be effected after the products are manufactured and packaged.

Trailing Meteors

METEORS are being used to determine air densities and temperatures in the upper atmosphere in a joint Harvard-M.I.T. research program sponsored by the Navy Bureau of Ordnance. The meteors are photographed from two stations, 18 miles apart, operated by the Harvard Observatory in the vicinity of Las Cruces, N.M. The photographic plates of meteor trails are shipped to M.I.T. where they are measured and reduced by a staff of computers at the Institute's Computation Laboratory. Fred L. Whipple, Professor of Astronomy at Harvard University, directs the program of photographing meteors, while Luigi G. Jacchia, a research associate in the Department of Electrical Engineering, is responsible for the reductions and the atmospheric research program at the Institute.

Essentially, the program is one of ballistics. Ordinarily, in the computation of gunfire trajectories, the air density is given and the deceleration experienced by the projectile is computed point by point. In the case of meteors, the deceleration is obtained directly from measurements on photographs of meteor trails, while the air density responsible for the deceleration can be computed for various points. Once the shape of the atmospheric density curve has been established, atmospheric temperatures are easily derived.

At the twin stations in New Mexico, wide-angle cameras are trained toward prearranged areas of the sky, so that the same meteor can be photographed from both stations. Cameras at each station are provided with rotating shutters which interrupt the photographic record of meteor trails at known and regular time intervals. The breaks in the meteor trails are measured and referred to the positions of background stars. Then, by triangulation, the position of the meteor in space can be determined at a great number of points equally spaced in time, from which the instantaneous velocities and decelerations are computed.

Measurements of great accuracy are essential to obtain reliable meteor decelerations. With four high-precision measuring engines, purchased by the Navy Bureau of Ordnance for use in the Technology meteor project, the accuracy in position measurements on photographic plates can be pushed to approximately two microns; with the present cameras, this corresponds to an error of roughly six feet in the spatial position of an average meteor. In the next few months, new cameras of a modified Schmidt type will come into operation which development should substantially extend the range of observed meteor heights.

With the present cameras, meteors have been photographed at heights ranging from 37 to 117 kilometers, although atmospheric densities have not been determined for any height greater than 98 kilometers. An interesting feature of the upper-atmosphere sounding by means of meteors has been the discovery of a strong seasonal fluctuation in the air density at heights between 70 and 85 kilometers. More recently, Dr. Jacchia was able to show that there is a noticeable difference between the atmospheric-density profile over New Mexico and that over Massachusetts – a fact which indicates that latitude may have a marked effect on such profiles.

The Importance of Fundamental Knowledge

In Developing Leaders to Assume Enlightened Responsibility in an Increasingly Complex Technology, Mutual Support of Education and Industry Becomes Requisite

By ALFRED P. SLOAN, JR.

TONIGHT is a significant event in the life of the Massachusetts Institute of Technology. We pause in our daily routine to mark the successful culmination of a two-year intensive effort. The M.I.T. Development Program now is completed. Its purpose was to create a reservoir of physical and financial resources, essential that M.I.T. may continue adequately to discharge its broadening responsibilities to our free society. An additional purpose has been to capitalize Technology's expanding opportunities for constructive accomplishment. But of far greater significance has been our intention that M.I.T. remain free to fulfill its destinies without prejudice, governed in its educational concepts, its scientific programs, and throughout all its administrative activities solely by its own interpretation of what constitutes the sound and the desirable based upon the truth. Such have been the Program's objectives. Such are now what we can call our accomplishments.

But that is not all. As friends of Technology, we would be remiss on this occasion if we did not express our appreciation to the Institute graduates, to corporate enterprise, to many philanthropic institutions, and to individuals who have supported our cause because of their respect for the Institute's accomplishments and appreciation of its significance as a fundamental source of enlightened progress. Thus, time, effort, and resources have been contributed by many. The result is a task successfully accomplished, the magnitude of which, two years ago, made it seem almost insurmountable. After all, 20 million dollars is not an insignificant sum in a project of this type, notwithstanding these days of colossal figures.

Alfred P. Sloan, Jr., '95, giving his address on "The Importance of Fundamental Knowledge."
Photo by Sam Vandivert

But we would be doubly remiss if we did not express our profound gratitude to our able chairman and his associates who have given unstintedly both their time and effort to the cause. It is to him and to them that we looked for the leadership and inspiration so essential to the success of any such undertaking. I am sure all the friends of Technology, whether or not gathered here tonight, say as I do: Thank you, Mr. Dalton, for a magnificent performance, well conceived and ably executed. And in saying this we realize how inadequate that recognition necessarily must be in relation to accomplishment.

Perhaps too few appreciate how change has affected M.I.T. during the past 25 years. As I see it, there has been both a revolution and an evolution. There has been a revolution in the sense that the Institute has emerged from the status of an engineering school with limited objectives to that of a scientific institution of unlimited opportunities, carrying with it corresponding responsibilities both to the economy and to the nation.

There has been an evolution in the sense that, under the dynamic and inspiring leadership of Dr. Compton, ably shared by Dr. Killian in the more recent years, M.I.T. has established for itself a position of recognized leadership as the outstanding technological institution of our time. It has earned this leadership by the soundness of its educational concepts and the scope of its scientific research. This has been done not only in time of peace but, more dramatically, in time of war by its technical contributions to our national defense. Every graduate, every friend of the Institute, all concerned with economic and scientific progress, have reason to be proud of the record of the Massachusetts Institute of Technology. Confidence in its future and the record of its past performance have been significant factors in the successful conclusion of the Development Program.

We look upon our universities, colleges, and other educational institutions as instrumentalities to process our youth that they may better discharge their responsibilities to themselves and to society. But today, to

my mind, that is far too limited a concept. With the advent of the mechanical age, an age stimulated by continuous scientific discoveries, these institutions have become, to a major extent, the logical sources of fundamental knowledge. They have the scientific talent. They operate in a climate conducive to fundamental thinking. Time is not a consequential factor. Fundamental knowledge is what productive enterprise applies to its material advantage and for its technological progress; and through the application of such knowledge, productive enterprise supports and advances our standard of living.

Scientific progress is a basic component of a virile and dynamic economy. It is the foundation of fundamental progress and national security. What has raised us to our present world economic predominance? What has enabled us to support, to a major degree, the economy of the western world's civilization? What will enable us to maintain our economic leadership and insure our national security against the dangers that threaten us? Nothing more importantly than our mastery of science and invention. Nothing more certainly than our ability to put the productivity of our knowledge on the assembly line of mass production. But to accomplish this it is essential that we maintain a continuous flow of this skill and understanding, and this we can insure only by expanding our reservoir of fundamental knowledge.

The economic progress of the postwar world will be determined by the creative ability of our research. The effectiveness of our instrumentalities of national defense will be similarly determined. American enterprise is expanding its research facilities and supporting organizations on a monumental scale. But it is a fact that only to a small extent, and in a limited number of instances, are the objectives of these expenditures directed to the area of fundamental knowledge. The greater part is for the purpose of applying fundamental knowledge, otherwise created, to the specific commercial needs of each particular enterprise. Expressed otherwise, enterprise has been concerned more importantly with exploitation than with creation.

Why has M.I.T. conducted its Development Program? On the announcement of its successful completion, why did Dr. Killian say, in effect, that it is the beginning and not the end, so far as the financial needs of Technology are concerned? The reason stands out crystal clear and it applies to all our institutions of higher learning which follow the same general pattern as Technology. Never have these institutions, which provide our fundamental knowledge, so needed financial support as they do today. In the last 10 years costs of education have quadrupled. It is stated that more than one-fourth of our colleges, universities, and technological institutions are operating with deficits. Like everything else they are caught in an economic dilemma of declining financial support as the old sources of revenue dry up, on the one hand, and lowered income, which means reduced purchasing power of their capital assets and rising costs of operation and capital needs for expansion and development, on the other.

If we are to maintain and expand our principal source of fundamental knowledge and perpetuate our free society, in which we all believe, then it is vital that we find a way to keep our colleges, universities, and technological institutions virile, progressive, and, above all else, free. This is impossible unless they have the essential financial support. It is well said that if we lose our economic freedom we lose all freedom. This is equally true if we lose our educational freedom.

There are a limited number of sources to which higher education can look for the really substantial help it needs. The one that comes first to mind is the Federal Government. We have become far too accustomed to look to that source for many things, the means for which we would be better advised to find for ourselves. If our educational institutions become dependent upon government for their support, then through the process of evolution they must accept political control. We need no better evidence of what this means in principle than the moving picture of current events.

Knowledge — A Sound Investment

Looking at the long-term position, so far as I can see there remain two continuing and substantial sources of private financial aid. One is the foundation. But the very circumstances which now prevent the continuation of private support of education in the substantial amounts which will be required will, in turn, prevent private foundations from becoming the source of expanding revenue for the long-term future.

The second source of financial support is corporate enterprise. An encouraging feature of the Technology Development Program is the generous support it has received from this source. Why should not productive enterprise, however constituted, take a part in the financial support of our universities, colleges, and technological institutions? Why should this not be done on an organized, as distinguished from a haphazard or opportune, basis? Why should not such support be recognized as a proper use of corporate funds on a parity with other business expenses? It seems clear to me that corporate enterprise should support the sources out of which flow fundamental knowledge; and do it in its own self-interest as a sound business investment.

I have spoken of fundamental knowledge in general terms. Fundamental knowledge divides itself into two categories with a wide area of no man's land between. One is the area of the natural sciences. Our great technological institutions, like M.I.T., confine themselves, to a major degree, to this area. The second is the broader area of the social sciences and the humanities. This area embraces the relationships within the social structure itself and of that structure with our productive economy. I am strongly of the opinion that problems relating to our social structure are of increasing importance, even if they are not directly related to the needs of our productive economy, and that they will have a far greater significance in fashioning the pattern of our society of the future than has been the case in the past.

Higher education is, in a sense, big-scale business. Industry in the postwar years has undergone an enormous development. Output has been dramatically increased. Working capital has expanded. Employment

has mounted and far higher wages are being paid. Tens of billions of dollars have been invested in the expansion of productive facilities. It is estimated that the population increase of the forties, if maintained during the fifties, will mean 30 million more people by 1960. This means more of everything just to maintain our present standard of living. If we are to advance our standards – and there is no reason why we should not do so – we must superimpose upon this "more of everything" a still higher level of productivity, or more of everything again. This demands a more intensive effort on a wider front to increase the flow of fundamental knowledge. Business has been able to strengthen itself in the highly profitable postwar years by retaining a large part of its expanded earnings for development purposes. Education has had no such opportunity. Yet today our educational institutions, like our business enterprises, need new and modern facilities; they need increased working capital and a greater revenue to meet the cost of everything if they are to maintain their relative position in an expanding economy and discharge their obligation as a potent and aggressive force in the evolution of our modern society.

What might be the *modus operandi* of broadened support of our educational institutions by corporate enterprise? Under existing law, corporations have the privilege of giving, as a contribution, 5 per cent of their yearly profits to objectives such as we are discussing, provided the funds for such objectives are given to accredited institutions. Financial support might consist of a grant for what I may call operations, such as fellowships, scholarships, and the like; or the support might go for capital goods, such as buildings, laboratories, and so on, or for general operating or overhead expenses.

It is important that consideration be given to the need of a well-balanced financial structure and that we avoid support in too limited an area, thereby involving an additional burden in the way of overhead expense. This consideration is too often overlooked. Continuity of any relationships that might be established is also a highly significant and essential factor. If our educational institutions are to be soundly supported and placed upon a strong financial structure, there must be a recognition of the time factor. A grant here and there, made for a specific piece of research or for any other purpose for a limited time, does not permit the donee institution to develop an organization and to attract to its staff talent of a high scientific caliber. Lack of security for the long-term future becomes involved. This is a realistic part of the problem that must be faced and solved.

A constructive approach to a more continuing and a better organized relationship between corporate enterprise and our institutions of higher learning might be secured if corporations were to form a foundation especially dedicated to such objectives. I am confident such a proposal, if advocated by management, would have the support of corporate stockholders. Into such a foundation might be contributed, from time to time, funds not specifically earmarked. The funds so contributed would be dependent upon the profits of any supporting enterprises, such profits varying from year to year; and, of course, the contributions would be determined by the business judgment of the board of directors of the enterprise.

Such a foundation could be operated by nominees of the contributing enterprises to whom would be delegated the responsibility of making grants either from the standpoint of the specific needs of an institution or from that of a more general public purpose. The advantage of such a plan would be that funds, which might not be needed immediately, could be accumulated and be put aside to be used at other times, thus affording a more orderly and sustained effort over several years.

A Philosophy for Industry

Many projects – the most significant ones of all, as a matter of fact – importantly involve the factor of time. While in no sense discounting the desirability of endowments, I question whether financial support under present circumstances should necessarily follow the endowment pattern. I am strongly of the belief that grants – and this applies particularly to corporate and foundation grants – should be liquidated within a limited number of years, say five or 10 years. A moderate grant spent over a few years may well accomplish a highly constructive result, one out of all relationship to the amount involved. It may serve to start a chain reaction out of which important developments may ensue, greatly expanding the original concept.

Some will ask: What is going to happen when the money has been spent? Who is to carry on the project? If the project has justified itself, it is reasonable to expect that further support will be forthcoming. If it has not justified itself, it should be liquidated. Further financial support demands a realistic appraisal of the project's future validity. One of the problems that frequently arises in all forms of endeavor is that of disposing of a project which may either have outlived its usefulness or have ceased to be efficient. If funds are specifically available, liquidation is difficult. In a sense the project then becomes a vested interest.

The financial support of our educational institutions by foundations involves no question of fundamental

M.I.T. Photo

The Sloan Automotive Laboratory at M.I.T. represents one example of industrial support of educational activities which makes a return to industry.

policy. It is to just such a purpose that the resources of foundations are dedicated. Financial support by corporate enterprise, on the other hand, may raise questions of policy on the part of those concerned with corporate management. Questions may also be raised by others who may believe that such support should be made by individual stockholders rather than by the corporation itself on their behalf. Nevertheless, I am convinced that the concept, although in no sense new and already in operation on a limited scale, is both economically and socially sound and vitally needed. It should be expanded.

Doubts as to the propriety or, more specifically, as to the legal justification of corporate financial support of our educational institutions will, of course, arise. Are such projects within the corporate purpose and hence within the power of the directors? I recently had the opportunity of examining a very comprehensive historical record of the legal phases of corporate giving extending back over many years. I was both gratified and surprised to find strong judicial support for the principle of such corporate giving in practically all of the relatively few cases that had been adjudicated. In some cases the action of directors in making a grant appeared, even from my point of view, to be far removed from the corporate enterprise; yet it received the sanction of the courts. After examining this study I wondered whether there were not more fear than substance in the point of view held by many. However, I am advancing here a broad concept without attempting to present the details. I am sure that such restrictions as presently may exist are within our power to eliminate if we have the will and purpose so to do.

There remain a few words to be said about the new School of Industrial Management now being organized at M.I.T. The purpose I had in mind in suggesting the new school was to provide an opportunity for the young men of today to better prepare themselves to meet the exacting demands of industrial management as they become the industrial executives of tomorrow. In other words, the purpose has been to correlate the complex problems of management in modern technical industry with science, engineering, and research. It has been my observation, from an experience of many years in technical industry, that executives with a background of science and engineering are unusually well qualified to deal with the intricate problems of industrial management in our technical enterprise. American enterprise is passing more and more into the technical area.

Few realize, I believe, the broad and exacting demands made upon the executives of today, especially in our large-scale enterprises. The exercise of sound business judgment will always be the keystone of success; yet to reach the highest level of effectiveness, executive decisions must evolve from, and must be supported by, a scientific appraisal of all related facts and circumstances. Industrial management has passed through a long process of evolution as the mechanical age has evolved. Today it has become, in every sense of the word, a matter of science — a profession. Therefore it seems entirely logical to assume that a scientific background will offer a very healthy climate for the development of the industrial executive.

In the administration of the new school, it is my hope that emphasis will at all times be laid on bringing into the training, in a truly realistic manner, the practical problems that face the industrial executive in his administrative capacity. The contribution that the new school can make in the future to higher standards of industrial efficiency and effectiveness will, as I see it, determine the extent to which this hope will be realized. The school will seek the co-operation of an outstanding group of industrial executives in planning its curriculum. They will contribute their managerial experience not only at the policy level, but in bringing directly into the educational concept those practical intangibles which, in the aggregate, comprise what is termed "management."

I am convinced that in time the school will establish for itself a position of leadership in the science of industrial management on a level with the Institute's other accomplishments. To that end its research problems and educational concepts should be broadly conceived. They should embrace all the significant components of industry, such as distribution, labor leadership, organization technique, and public and employee relationships. Thus the school can offer a useful service to industry in the scientific examination of problems of broad significance to the economy as well as study of specific problems in which individual units may be interested.

The role of industrial management is of great and expanding significance in our society of today. Upon its effectiveness depends the efficiency of the economic system as a whole. Upon it rests the end responsibility of making the competitive system of enterprise work. Rightly or wrongly, that responsibility must be faced by management irrespective of the handicaps that may be forced upon it and over which it may have little control. The structure of our economy is becoming more and more complex through evolution. It is the sequel of the industrial age. More complex problems arise in every area of enterprise, such as the interrelationships of one part of the industrial system with the other; the expanding role of government with its increasing interference with the economic processes; and the ascendancy of the labor movement. Many other influences have brought problems to industrial management, unknown even a few years ago.

Out of these facts and circumstances has evolved a new concept of the responsibilities of management in a free society. Management recognizes that it can no longer limit its horizon of responsibility to the mere production and distribution of goods and services, no matter how efficiently that may be done. It must broaden its scope of leadership. It must assume the role of economic statesmanship. It must consider the impact of its policies upon society as a whole in terms of advancing living standards and of expanding employment with stability. It must better inform itself as to the fundamental relationships within the system it operates in order that it may establish its procedures at the policy level with a maximum of intelligence and understanding. It must become increasingly more articulate as to what is to be done or undone in national economic policy in order that the system may

(*Concluded on page 526*)

The Need for Unity

We May Be Discovering that Freedom and Dignity Can Be Preserved Far Better by Partnership than by Compartmentalized Action

By PAUL G. HOFFMAN

A GREAT many momentous things have occurred here and abroad during the past generation, and I often think that the sensations and alarms thrust before our eyes almost every day must certainly distract us from many of the really significant developments of our times. These are the slow, yet certain, forward movements in human affairs that seldom if ever gain the headlines. One of these basic shifts in the American pattern already has had a great impact on our way of life and, in my opinion, will have an even greater impact in the years ahead.

When the United States of America set up shop in 1776, it was just as highly compartmentalized as a modern department store. Each state insisted upon absolute sovereignty with a vigor that, for a time, strained the young republic at the seams. This feeling of separatism, naturally enough, ran through the whole society. Religion demanded that it be left severely alone by everybody, particularly by government and competing sects. Farmers and businessmen put up big "no trespassing" signs over their particular areas of activity. Education was simultaneously erecting its structures in yet another clearly walled-off sector of society. "Tend to your own business" is not merely a tart comment; it puts into words an idea that was firmly embedded in the minds of whole generations of early Americans.

Paul G. Hoffman, of the Ford Foundation, and formerly administrator of the Economic Cooperation Administration, speaks on the nation's need for unity of purpose.

Photo by Sam Vandivert

I am not decrying this period in our history. It is certainly clear to me that it was the one possible way of carrying out, in those times, the firm intention of the founders that government must serve as the people's agent in certain matters, and in those matters alone; and that it shouldn't be allowed to meddle in other areas. Our fathers knew the danger of governmental tyranny, and given the economic and political conditions of the late eighteenth and nineteenth centuries, the extension of this feeling into other parts of the new society was inevitable. This era was one of insularity, and it lasted a long time. It took a civil war to bring an end to this political era by driving home to Americans everywhere that political compartmentalization of the various states probably wasn't the best approach that an expanding nation might take in solving its problems.

Breakdown of Separatism

The notion that businessmen, farmers, educators, and workers also had – that they could remain aloof from one another – began to give way shortly after the Civil War. In one way or other, each group began to venture forth from its sacrosanct cubbyhole. Farmers began to perceive that businessmen and workers were customers. Educators started to move off their campuses and out into the world of affairs, a move vastly stimulated by land-grant colleges. And the American public decided it was about time for their government to take a hand in regulating those business affairs they thought were getting dangerously big and hard to handle. The trend began with the Interstate Commerce Commission, and, shortly thereafter, in the early years of this century, trust busting moved from political platform to political fact. Campaign slogans turned into the Sherman Antitrust Act, the Clayton Act, and the Federal Trade Commission. Yet, when we came to the end of World War I, the myth of insularity among government, business, and education still had a potent hold on the minds of Americans. I have not asked any historians or social scientists about this, but I suspect that this feeling had its roots deep in a conviction that we could preserve our freedom only if we managed, somehow, to keep business as far as possible out of the hands of government, and government as far as possible out of the hands of business; if we could keep business from interfering in education, and educators from interfering in government, and so forth.

It is perhaps accurate to say that during the 1920's many of us still believed that the place for educators was in ivory towers, and that businessmen and employees were likely to prove troublesome as soon as they moved out of corporation board rooms and union halls. We certainly still felt that the national interest might be imperiled if government built anything more than a footbridge across the Potomac into either of these other areas. It was only dawning on us slowly that the United States was a whole machine that depended for efficient operation on the smooth meshing together of its various parts. Parenthetically, I might say here it seems to me very possible that this feeling of insularity extended well over into the field of international relations and found disastrous expression in our failure as a nation to give effective support to the League of Nations.

Then came the national depression. Many of our national myths went into the ash can, among them the notion that certain major activities could be walled off and left to their own devices. No one can look back on the depression and say that it was a mighty good experience, because it wasn't. In addition to the untold human hardship the depression brought with it, it produced the immediate and astonishing reaction to national insecurity which we promptly dubbed "government planning." From a nation dedicated to individualism, both the rugged and not-so-rugged varieties, we turned into a nation which appeared to see its sole chance for survival in programs written in Washington. I do not want to dwell on these sad memories. But I do want to point out here that in going through the agonies of picking up the pieces, we happened upon two related and significant truths. First, we discovered the value of unified effort in the face of common peril. Second, we discovered that a partnership of business, government, and education – a working recognition of interdependence, in short – was not the big bad wolf we had always thought it to be but that, on the contrary, it was an absolute condition for continued progress. In my opinion, in 50 years this blending of social forces will be marked by historians as a development of outstanding significance. Because we are so close to the scene, we are probably not as aware as we should be of the manner in which this partnership is actually taking form and its possible meaning for the foreseeable future.

Partnership of Colleges and Industry

The offices and factories of many of our large corporations today are being used as classrooms by neighboring colleges. Employers and employees seek the co-operation of our great educational institutions in their search for fair answers to hard questions that trouble them. The businessmen of the Committee for Economic Development find more than enthusiastic response among the teachers of the country for their work-shop program in the teaching of basic economics – a situation that would have been unthinkable even 25 years ago. Government turns hungrily to both business and education for help and guidance across the whole field of national life. These days it is not unusual for all three elements in our society to join around a single table to work out common problems. The important phrase here is "common problems." In recognizing mutual problems and objectives, we have come to realize that we are not infringing on the freedoms that are uppermost in our national consciousness but, in fact, are taking long steps toward giving them substance and safeguarding them. Freedom without law and order and unity is an empty word. I have been referring here only to the peacetime forms of this new partnership. There is no need to point out the obvious about its enormous contribution during World War II.

A little more than 30 years ago, I came out of the West to take a vice-president's desk at the Studebaker Corporation. My vocation was selling automobiles, and my avocation was highway safety. I was naive enough to think that I could enlist all of my colleagues in the sales end of the industry as fellow missionaries. Don't mistake me. I might have had humanitarian impulses, but I know I was certain that we had better do something about the increasing slaughter on our roads if the automobile industry was not to be affected with a permanent limp.

Ranging out of my headquarters in South Bend, I tried to bring into the fold my opposite numbers throughout the industry, with a total lack of success. After some months of futile effort, I had just about concluded that the cause was hopeless, and that I had better put the whole matter in my "I told you so" file for use many years later. At that precise dismal moment a letter appeared on my desk. It stated that the writer was very interested in highway safety, had watched my struggles to do something about it, and wouldn't I please stop in to see him the next time I happened to be in New York. The letter was signed, Alfred P. Sloan.

Naturally enough, I happened to be in New York in a very few days. As a matter of fact, in a very few hours is probably more accurate. Alfred Sloan, it turned out, had done a lot more thinking about highway safety than I had. Our talk was long and heartening, but I must admit I was completely unprepared when, as I rose to leave, Alfred Sloan passed across the desk to me a personal check for $25,000 with the hope that it might be of some assistance to the highway safety campaign. That check was important, far more important to the American public than it could possibly have been to me personally. It gave impetus to the founding of the Automotive Safety Foundation. Some of you may know of the Foundation's work during the past generation and a half. At the time it came into being, the highway death rate in this country was 15.9 per hundred million vehicle miles annually. Last year the comparable figure had dropped to 7.1 deaths per hundred million vehicle miles.

Alfred Sloan was one of the first of our industrial leaders to recognize that compartmentalization in business had become outmoded. His position in General Motors was never that of a dictator, but of a leader among equals. He saw that his prime responsibility as the head of that enterprise was to create conditions under which each man individually could make his best contribution; further, he saw that creation of optimum conditions for bringing out particular talents would at the same time create a spirit of team

play that could be achieved in no other way. That same attitude found welcome expression in the industry as well. To the always intensely competitive automobile business, Alfred Sloan brought his singular talent for getting people together in a common cause, in persuading a notably reluctant group to work in harness for the solution of mutual problems. Later on, the Sloan Foundation was to demonstrate in still another way this man's concern with the challenge of finding ever better ways of meshing together the complicated gears of the American machine.

In replacing the walls between the major groups in the United States with windows and doors, we may well have started a reconstruction job which portends far more than any of us can guess. I suggest that it has much more meaning than merely the fact that a great many professors are now on cordial speaking terms with a great many bankers and union representatives, and that businessmen and government officials can get together without blasting the pictures off the wall of the meeting room. Indeed, we may be discovering how to forge the links that will hold our country together at a particularly critical moment in history. We may be discovering that freedom and dignity can be preserved far better by partnership than by compartmentalized action. Even more important, we may find in it a most useful lesson in the task of bringing free men together in a common front for winning the peace. For if we have found out that compartmentalization is an outmoded way of life within our own society — in our industries, in our political structure — why can we not say to the rest of the world that it will work among the nations?

The trustees of the Ford Foundation are so certain that absolute top priority must be given to the question of man's relationship to man and the preservation of free peoples and institutions that they have put the resources of that great enterprise wholly into programs aimed at that single grand target. The trustees saw that unless people somehow, some way, found positive means for waging the peace, all other efforts to better the surroundings and the dignity of man would only end up in atomic rubble.

I joined the Ford Foundation because I share that view completely. I came away from two and one-half years with the Economic Cooperation Administration with twin convictions that I hold with all my mind and heart. The first of these is that an enduring peace, built on freedom and justice, can be won if the free people of the world will dedicate themselves unreservedly to the task. My second conviction is that peace can be won only if free people everywhere lock arms so tightly in the common cause that no force can tear them apart. I have called those two statements personal convictions. I want to go further and call them facts, hard facts that you must wrap your minds around. It is horribly strange, but also horribly true, that while there never seems to be too much difficulty about mobilizing nations for war, mobilizing them for peace is quite a different matter. Many people still seem to be making the error of looking on peace negatively as a mere absence of war. But I say to you that unless we consecrate ourselves as wholly to winning the peace as we have, from time to time, consecrated ourselves to military victory, the prospects are dim indeed. Peace has to be worked at, not dreamed about and left to someone else.

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The reason we have to lock arms is simplicity itself. No single nation has the resources to stand up against an onslaught from the Soviet Union and its satellites, not even the United States, mighty though it is. The free nations can win the peace only if they stand together, work together, and wage the peace together. But if we do lock arms and add the resources of Western Europe to those of North America, we will have a commanding advantage over any possible combination of adversaries.

Almost every day I hear or read something which indicates a feeling that Western Europe can be regarded as a relatively unimportant part of the earth, a weak sister with nothing in particular to contribute. To say that such views dismay me is a masterpiece of understatement. Western Europe has a population of 275,000,000 men and women of the same stock, outlook, and background of most of the fine people in these United States. That's 100,000,000 more people than live in this country and Canada put together. I don't want to bore you with statistics, but there are a few typical comparisons I think every American should paste firmly in his hat. The combined coal production of the United States and Western Europe is 965 million metric tons a year. The annual coal production for the U.S.S.R. and its satellites is much less than half as much — 386 million metric tons. Annual power production in the United States and Western Europe together totals 612 billion kilowatt hours. The combined Soviet total is 132 billion kilowatt hours. We and our free neighbors in Western Europe have a crude steel production capacity of 137 million metric tons, against a Soviet total of 34.8 million metric tons. There is more than six times more oil production an-

(*Continued on page 522*)

M.I.T. Photo

Character Building—The Job of a Lifetime

The Qualities Which Are Most Valuable in Any Profession Are the Ones Which Cannot Be Bought at Any Price

By HAROLD R. MEDINA

COMMENCEMENT ADDRESS

I GREATLY appreciate the honor of having been selected to address you here today; and I hope that what I have to say may be interesting and helpful. In these difficult and soul-stirring times, it is important to keep our feet solidly on the ground and to concentrate on fundamentals.

When I was a lawyer, particularly toward the end of my career at the bar, I did a good deal of what lawyers call jury work. These trials, to a judge and jury, are exciting affairs: Sometimes the principal figure will be the defendant, charged with some serious crime; sometimes the principal figure will be a witness, whose veracity is under attack. There is almost always some individual who stands in the limelight.

And so I developed a certain technique in my summations which I shall describe as a background for what I have to say here this morning. I would first remind the jurors that most of us go through life in a humdrum sort of way: Nothing spectacular happens to us and we get most of our pleasures and excitement at home with our family, in our business, or in cussing out the politicians. But suddenly, in the most unexpected way, and often through no act or purpose of our own, we may some day find ourselves playing the principal part in one of these great dramas just as is so-and-so here in court today. And if we do, I go on to say, I can tell you now that our whole life will be open to scrutiny and in it will be found a certain unity, a certain gradual development culminating in the occasion or event in issue. Then I used to weave the evidence into a picture of the particular principal figure in an effort to demonstrate either his innocence or his culpability, the fact that he was or was not telling the truth, and so on. The analogy was effective because it was immediately recognized as representing life as it really is; and it served my purpose to get the jurors interested by supposing themselves suddenly subjected to such an ordeal, while at the same time furnishing a rhetorical device for the marshalling of the evidence to support my side of the case.

Yes, no one of us can tell when we may have to meet some crisis, some weighty responsibility, perhaps the duties of some high public office which, viewed from what we know of ourselves today, may

seem almost fantastic. And when such a crisis or such responsibilities come, if they do, you may rest assured that success or failure will depend on the very sort of unity, the very sort of gradual development and growth, of which I speak. You young people cannot know — it is impossible for you now to imagine — what great figures you may, in time, become.

Accordingly, it seems appropriate that I should try to help you consciously to develop your own powers over the years, so that the unity and the gradual development of which I speak may not be the haphazard effect of mere fortuitous circumstance and the accidents of environment. It is important, too, that one should not pay such absolute homage to the itch to get ahead and beat out one's competitors that one forgets the more important spiritual values which may easily get lost in the shuffle.

In developing my subject, I am going to tell you a number of little stories all taken from my own experience; and I do this because I have found that generalities and hypothetical situations never leave quite the same sort of lasting impression as does the recital of things that really happened. I have another reason which I may as well confess at the outset. The subject of character building is a slippery and difficult one. It means so many different things to so many different kinds of people that I must leave a good deal to your imagination. True stories have a way of sticking with us, as I found to be the case when I was a law teacher, and they help us later to formulate principles in language of our own.

When I was a boy, I attended a preparatory school known as Holbrook's Military Academy in Ossining, N. Y. One day a number of us were playing around the gymnasium when one of the boys, who was the leading school athlete, came up and said he had something to show us. He then held out his hand and put a 50-cent piece near the tips of his fingers and, to our amazement, we saw the 50-cent piece turn over and over until it reached the base of his palm, then it turned over and over on its way back again to the tips of his fingers. As far as we could tell it was sheer magic. We could not observe a single motion of his hand; and he did the trick over and over again. Later we found he had been practicing this little stunt for about six months alone in his room. Persistent, persevering effort had made it possible for him to develop the little muscles and nerves on the palm of his hand and the inside of his fingers so that the manipulation we had observed became possible to accomplish.

I do not need to explain to a gathering such as this how it is possible to train one's muscles. I can remember the time when my youngest boy, who was for two successive seasons the intercollegiate pole-vault champion, practiced hand shifts in his room by the hour with a short pole. He did not naturally have much spring in his legs, and he trained and trained with all sorts of special exercises to develop this. We have all seen the members of a gymnasium team performing seemingly impossible feats of muscular control upon the parallel bars. And I think most of us here recognize quite as easily the processes of discipline by which the mind is trained. It is a subtle and elusive procedure, but the results are everywhere manifest and it would doubtless be difficult to find anyone in an academic atmosphere such as this who would deny that perseverance is just as effective in the one field as the other. What I hope to demonstrate is that the building of character and will power responds to the same sort of discipline. Perhaps the process takes a little longer but, fundamentally, it is quite the same.

After I had been teaching for 25 years at the Columbia Law School, I reached the end of my rope. The demands of my professional work and particularly a number of long jury trials, which kept me on the go all day and through a good part of the night, spelled the end of my teaching career. As I approached my last class at the law school, I turned over in my mind what I could say to those boys and girls that would represent the most important lessons I had learned in my experience in life and as a participant in hundreds of court proceedings. After considerable reflection and with illustrations, which I have mostly forgotten now, I told them this: "In the first place, you students have been working hard to get good grades; you know that the best jobs will be available for those who stand highest in the class; and all of your energies have been absorbed in learning the techniques of what is to be your profession. But let me tell you this," I said, "brains are cheap." And truly, so they are. You can always hire some bright person to do a good, technical job. But the qualities which are most valuable in any profession are the ones which cannot be bought at any price; and they are plain, ordinary guts and loyalty. We have heard so much loose talk about loyalty in the last few years that the ordinary garden variety seems

M.I.T. Photo

In reading order are Karl T. Compton, chairman of the M.I.T. Corporation, the Honorable Harold R. Medina, who delivered the commencement address, and President James R. Killian, Jr., at the Institute's 85th commencement.

to have been forgotten. I mean that loyalty to one's college, to one's friends, to one's family, to one's religion; the kind that builds from the ground up and makes loyalty to one's country inevitable and adamantine. I did the best I could to get it into the heads of those students that their success at the bar and their success in life would very largely depend upon a combination of unswerving, unselfish loyalty, and sturdy tenacity and doggedness.

Then I told them something else; that there will be plenty of times throughout life when one is beaten, when one's most cherished hopes are suddenly dashed to the ground and every attendant circumstance makes one feel that it has all been the result of injustice or favoritism or envy or what not. When this happens, I told these students, as it surely will, I want you to remember that America loves a good loser. Just keep your mouth shut and go about your business. No one likes a squawker. The more he squawks and puts the blame on somebody else, the more his listeners suspect that the fault lies with himself. There is little profit in advertising one's own discomfiture.

Now I know what you are thinking. You are saying to yourselves, "What has squawking got to do with character?" And the answer is that it has plenty to do with it as, on a little reflection, you will have to admit. The ability to keep on plugging ahead despite setbacks, discouragements, and downright disaster is no mean asset.

Let me pause here for a brief moment and, by way of footnote, direct your attention to the fact that a persistent following of these little pieces of advice, year after year, will build a lot of character. It will go far to develop the type of man who is a good man to have on your side in a knock-down fight.

It was shortly after this little speech to my last class in the law school that I began to perceive a very serious weakness in my own character. How strange it seems to me that so many people think I am one of those calm, cool, calculating individuals with lots of self-control. The truth of the matter is that I am just the opposite. Some of my bursts of temper have got me into a lot of trouble, too.

When I was a very young man in my twenties, I used to argue a number of appeals before what we New Yorkers call the Appellate Division of the Supreme Court, First Department, which sits in the Appellate Division Courthouse at Madison Avenue and 25th Street in New York City. One day I was arguing a case which involved a man who had fallen overboard and had been sucked under and drowned when the captain of the tug reversed the engines. I had hardly started my argument when one of the judges who was sitting at my extreme left, and who was then one of the more recently designated members of the court, slammed the record down on his desk and said, "There's nothing to this case." Well, I leaned back and let him have a blast that would have taken his whiskers off, if he had had any. It was a stupid thing to do; it resulted in my losing the case; and it did not make the slightest particle of difference that I was fundamentally in the right and he was in the wrong. As a matter of fact, he never forgave me for that outburst. Later on that man became the presiding justice of the court and time and again when I was waiting around for one of my cases to be reached for argument, I did not even dare go out for a smoke for fear that he would suddenly call the calendar and take a submission on me, which he did on one occasion.

Then there was another time when I was lecturing to a great crowd of students preparing for the bar examinations. There must have been about twelve or fifteen hundred of them crowding Town Hall and I was lecturing away when suddenly I looked down, and in about the fourth or fifth row, and right in front of my nose, was a man sound asleep. I jumped down from the platform, ran up the aisle, and took him by the collar and threw him out. At least I threw somebody out. Some 20 years later a man came up to me in the street and shook hands and said: "Don't you remember me? I am the student you threw out of Town Hall way back in 1922." "And, what's more," he continued, "you threw out the wrong man." And I suppose that is just what I did. In all the excitement of my running down the aisle, the fellow who was asleep woke up and I threw the wrong man out.

Well, anyway, I soon began to find out that I would have to control myself, especially when I got into jury trials where one little outburst can have the most serious consequences. And so I worked on myself, year after year. It was pretty tough going, I can tell you. But finally I achieved a measure of success.

Not so many years before I went on the bench, I was assigned as counsel to defend a man named Anthony Cramer, charged with treason against the United States. It was a difficult and distasteful task but I undertook it as a patriotic service. Moreover, as a member of the bar, I was under a duty to accept such an assignment, even though I had to serve without compensation. Lawyers do this sort of thing all the time. This was all during World War II. Cramer had had some dealings with the saboteurs who came over from Germany on the submarines, and public feeling was running pretty high. One day during the trial, when I was walking up the center aisle of the courtroom to the counsel table, a spectator suddenly stood up and spat in my face. I had to do some quick thinking. If the incident became known, it certainly could not help either me or my client; and so, without batting an eye, I walked on up to the counsel table, wiped off my face, and said nothing to anyone about it. I am pretty sure that 10 years before I would have seized the man by the throat and created a terrible rumpus.

Well, that is about all I have to say. These things can only be discussed in the concrete. Generalities are not convincing. What I have tried to do is to indicate to you by these few illustrations what can be done by persistent, unremitting effort. And don't forget this. This self-control business is really more important than all the others put together. There is a certain spiritual quality to self-control that is hard to explain. Indeed, I verily believe that all the other qualities which we commonly think of in the aggregate as "character" stem from the discipline and control of our animal instincts. Only then can we truly appreciate the things of the spirit; only with self-control can we make of ourselves the men we wish to be. A lifetime of this kind of character building will guide the sort of gradual development which results in a unity of which we may, in due course, perhaps feel proud.

Tradition and Progress

Graduates Admonished to "Accept Life Daily, Not As a Cup to Be Drained, but As a Measure to Be Filled"

By SIDNEY LOVETT

BACCALAUREATE ADDRESS

WHEN your president asked me to be with you on the occasion of your baccalaureate, I accepted his invitation with unmixed pleasure. My association with the Institute, though not official, has been long and precious. As a boy, I remember the brownstone and brick buildings on Boylston Street. On my way to school in Cambridge I watched the first of these noble halls arise on this side of the Charles River. In that connection I recall public excitement as to the identity of a mysterious Mr. X, who turned out to be the late George Eastman, one of the many benefactors of the Institute. For 13 years I had the honor of serving the Mount Vernon Church, located at the Boston end of Harvard Bridge. In the parish were members of the Technology Faculty and their families; and through the congregation and Young People's Society there was a steady flow of Technology students. I remember when Wallace Ross became director of the Technology Christian Association and it was my pleasure to serve on the board of managers of that organization until, in 1932, I left Boston only to get as far as New Haven. These happy recollections contribute to the pleasure of being here this afternoon.

I have reserved one final and personal association with the Institute for special reference because it gives an unfading significance to all the rest. Everett Moore Baker was just about my dearest friend, and onetime colleague. He entered upon his duties here as dean of students the same year you seniors came to the Institute as freshmen. You are privileged to have known him longer and more intimately than any other class; you are the "first fruits," so to speak, of his wise and generous friendship and care. Had he come back from his mission of good will to India last summer, he would have been with you today, and later at your commencement, to wish you Godspeed. You have been instrumental in establishing the Everett Moore Baker Memorial Foundation for the purpose of advancing his ideals and objectives. This, in itself, is a noble and fitting act of devotion. Yet I would further charge you and myself with the greater dedication of ourselves as so many living memorials to a man who was so modest that he never knew how great he was; to a friend who never set any bounds to his own capacity for friendship; to a servant of God and humanity who, in a troubled world, "never turned his back but marched breast forward, never doubted clouds would break, never dreamed, though right were worsted, wrong would triumph."

Let me develop our subject "Tradition and Progress" by relating an incident out of my own experience. During the war years I was exiled from my office, as chaplain, in one of the freshman dormitories on the Old Campus. My quarters became the military P.X., with Coca Cola and Nabs and razor blades on tap instead of religion. With the postwar readjustments my office was restored, the familiar sign, "Chaplain's Office," was replaced on the wall just outside the door, and we were open for business. Well, within 24 hours the sign disappeared. In a day or two it was replaced by a much more imposing board with the familiar legend, "Chaplain's Office." One of my janitor friends said: "You don't expect that to stay there very long, do you?" I said, "No," and sure enough, by the next day it was gone. A few days later the old sign reappeared, very much the worse for its absence. To it was scotch-taped a dollar bill and a sheet of paper, bearing the familiar verse from the Book of Job, "The Lord gave, and the Lord hath taken away." I put the dollar

M.I.T. Photo

Taking part in the baccalaureate service were (left to right): Karl T. Compton; the Reverend Sidney Lovett, chaplain of Yale University, who delivered the baccalaureate address; the Reverend Dana McLean Greeley of Boston's Arlington Street Church, who led the call to worship; and President Killian.

bill in my discretionary fund, and replaced the verse from Job with an appropriate text from Saint Paul's Epistle to the Ephesians: "Let him that stole steal no more." The next morning both sign and inscription were gone. Finally, the very efficient Service Bureau sent around a painter, who inscribed "Chaplain's Office" on the wall, with an arrow pointing in the direction of the office door. The paint was hardly dry before there appeared, taped underneath the legend, a sheet of theme paper on which was written that very familiar Biblical phrase, "O ye of little faith." There was no text with which I could cap that employment of an ancient pronouncement. I thought at the time, and I still think, wittingly or no, it represents a proper judgment upon our generation for our lack of the faith principle that must precede all knowledge. The world convulsions of the last two or three decades have shaken our faith in the past and today they cloud our faith in the future. "We see not our signs, there is no more any prophet: neither is there among us any that knoweth how long." Yet, past and future meet in every step that we take, in every breath we draw. As exiles or as explorers we are involved sooner or later in the tide rip of contemporary life; for as David Livingstone was wont to say, "Standing still is the one thing more impossible than going forward." Hence it is incumbent upon you and me, as men who are in the way of being educated, to get this binocular view of past and future into some kind of immediate focus.

In a little book entitled *Recollections*, Lord Dunsany tells of traveling an old Roman road to Tunisia. He came upon an ancient stone marker by the wayside and turned aside to read the inscription. There were two inscriptions. The first read: "We are of the tenth legion." The second read: "We are of the tenth legion also." Between these two inscriptions and their dates was a gap of several centuries. Together, they just about spanned the duration of the Roman imperium in that part of the world. Separately, they witnessed to men in widely different times who served in the same legion under the aegis of the same imperial tradition. In the year 1861, the Commonwealth of Massachusetts granted the Institute its charter, in response to the petition of William Barton Rogers and those who were joined with him in his desire to establish in this community a great institute of technology. Well might President Rogers and the small group of faculty and students associated with him have declared: "We are the builders of the Institute." Subsequent events have eloquently justified their faith. The brook became a river and the river became a sea as thousands of students have received here the benefits of a scientific and technical education. From our lips today, as those who are the latest to come stand in this great succession, swells the glad rejoinder, "We are the builders of the Institute also."

Gilbert K. Chesterton once suggested that to respect tradition is but to extend the vote to our ancestors. Something of a traditionalist himself, Mr. Chesterton is here content to stress the more negative aspect of the matter. The positive attitude is to discover tradition to be a kind of cement that binds persons together in the fabric of life. Tradition holds us together in families. Tradition binds us together in religious bodies. Tradition it is that unites us in the fellowship of a college or an institute. Tradition it is that seals our citizenship in a particular state or nation. But there is one final and more inclusive word to be said. Tradition it is that gives the individual a sense of loyalty to all mankind, a consciousness of being bound in the bundle of life with all our fellow men. This is the trademark of the humane man or woman, who feels himself or herself personally implicated in the weal and woe, the hopes and fears, the glory and shame of our common humanity.

Now, like the state or the machine, tradition is a good servant but a bad master. It serves, as we have just suggested, as a kind of cement to bind us together as a family or community or nation or race. But when we confuse tradition with the edifice of life itself, and to the exclusion of the element of growth and development, then we are guilty of mistaking the means for the end and trouble is afoot. There have always been two ultimate groupings of humanity. There are people who are primarily fascinated by the future, and there are other people who are persistently attached to the past. One group lives on the assumption of change; the other pins its efforts to the maintenance of some *status quo*. Society seems able to reproduce a sufficient number of both types to maintain a fairly constant struggle between the two. This conflict, whether on the political or the religious level, so often results in a narrow and sterile partisanship which obscures the real issues of life. Such a condition makes it more imperative for men and women to whom tradition is something powerful to bind together the past with the present and the future, since these are still essential to progress and to the development of new forms of human life and thought. If I could put this notion into a kind of talisman for your remembrance, it would be this: Give the best that you have received from the past to the best that you may come to know in the future. Accept life daily, not as a cup to be drained, but as a measure to be filled with whatsoever things are honest, pure, lovely, and of good report.

I have met an increasing number of undergraduates the last two or three years who seriously doubt the value of the educational process in which they are engaged. This mood is, in part, the result of the unsettled conditions of the world. I may be frank and say that it is also a kind of occupational disease quite prevalent in a strictly liberal arts college or university. There, the end results of education are not always as clear as they must be at Technology, where education is definitely and honestly regarded as a means to making a livelihood in one or another of the scientific professional fields. Let no one from the more venerable and ivied houses of learning ever look down their intellectual noses at you who have made the great discovery that true knowledge involves a direct participation in that which is known. Yet I would remind you this afternoon that making a living is best understood as a part of the more important business of creating a life. Here at the Institute your primary preoccupation with the prose of life, facts that can be weighed and measured, should not preclude your increasing concern, here and outside, for the poetry of life, which comes from the interpretation of these facts in terms of meaning and value. I conceive it to be the combined operation of

(Concluded on page 520)

M.I.T. Photo

Qualities Expected of the 1951 Graduate

Benefits of Advanced Education Impose Professional Responsibilities for Dealing with the Human Side of Living in a Highly Industrialized Epoch

By JAMES R. KILLIAN, JR.

FAREWELL ADDRESS

In concluding these exercises in happy observance of your graduation, I wish to speak a personal word in behalf of the Corporation, the Faculty, and all other members of the staff who have known you and worked with you. In a very personal sense we are reluctant to see a class take its leave, just as everyone is loath to see friends and colleagues depart. In a professional sense we are happy to see you go in the same way that the coach, proud of his team and confident in its training, welcomes the opportunity to send it into play. These are the mixed feelings we experience in bidding you farewell as students and in welcoming you into the distinguished company of M.I.T. graduates.

You, too, doubtlessly have mixed feelings as you close this chapter of your career. I am certain that many if not all of you leave Technology with a feeling of relief and release. That is a natural and understandable reaction after a period of sustained pressure. Discharge through a nozzle, if I may inject a thermodynamic note, is usually accompanied by a drop in temperature. It is my prediction, however, and certainly my hope, that as your experience and accomplishment at the Institute recede into the past, your attachment and affection will grow. As you pass the milestones of your fifth reunion, and your tenth, and on, you will have begun to acquire the distinctive patina of the Technology man, a patina compounded of pride in somehow having conquered its high standards, of loyalty, not of the rah-rah kind, but of quiet affection, and of a sense of assurance in belonging to a team that has had a winning streak for over 80 years.

An occasional Technology man, I might add, doth boast too much of having been graduated, and would have his listeners believe that Technology is all and more that our favorite cheer says it is, that only mental giants can survive the fire. This has led, in some quarters, to the Institute's acquiring a reputation for being tougher than it really is. The true state of affairs is illustrated by a remark that Horace S. Ford, former Treasurer at the Institute, once made to the son of an Alumnus, a prospective freshman, who was fearful of making the grade: "Son, what are you worrying about; your father got through, didn't he?"

In speaking of your status as an Alumnus, it is appropriate to point out that one of the distinctive features of the American college, in contrast to colleges and universities in many other countries, is the continuing participation and interest in its affairs by its alumni. In this regard M.I.T. is strikingly fortunate. Our Alumni help in selecting the students who come here; they share in the government of the Institute by

membership on the Corporation and on its Visiting Committees; through 80 or more clubs and nearly 70 active class organizations, they maintain contacts with each other throughout the world; they frequently help the young Alumnus to get a job or to adjust himself to a new environment; they seek and themselves generously give funds to support and strengthen the Institute; and they jealously guard its interests and its reputation.

Some of the reasons for this family feeling I have already suggested, but there is another and more fundamental one. Our educational institutions, along with our churches, are expressions of the nation's highest ideals and hopes. They were founded by unselfish men for altruistic purposes; they have been maintained and developed by a whole succession of people who have given more than was expected of them. They have come to be recognized as cases, where, under conditions more ideal than in the community at large, young men can freely develop those attitudes of mind and spirit so essential to our democratic society. The nation conceives of our colleges as communities held together by a humane and tolerant spirit of mediation, reconciliation, and reverence for the individual – communities governed by a passion for truth, a preoccupation with ideal objectives, and freedom of thought and speech. It conceives of them as seedbeds of democracy.

Such institutions could not have been created except by altruistic men, and, by the same token, this institution and the many others throughout the land command the active interest and support of altruistic people. The nation expects our colleges to be the citadels of its ideal aims; the perpetuators of its standards, its heritage, and its promise. Similarly, the nation expects, and has a right to expect, special qualities in the graduates of these institutions. It expects the competent use of the training received, of course, but it expects a great deal more than this. It expects good judgment and self-discipline, moral integrity, and active citizenship.

With Opportunity Comes Obligation

From those who are professionally trained, as in science, engineering, architecture, and management, the country expects something more. It expects that the professional man be motivated by the professional ideal of ministering to the public rather than by the limited objective of working solely for himself. The country desperately needs engineers and scientists at the present time; but it even more desperately needs engineers and scientists who not only can increase our standard of security and our standard of living, but also can increase our standard of living together, men who have courage and understanding to tackle the overriding human problems of today.

Our own colleague, Professor Emeritus Warren K. Lewis, '05, of the Department of Chemical Engineering, whose influence as a great teacher enriches us all, has pointed out in one of his eloquent statements about the obligations of the engineer that, in the early days of our country, the primary function of the engineer was to increase production, while today the engineer not only must do this but also must deal effectively with the human problems of industry which are currently its most important and difficult problems.

I cite these qualities expected of the college graduate, especially the graduates of an institution of this kind, not because you are unaware of them, but rather as an expression of our faith that you, as nearly as any group of college graduates, personify these qualities and have an opportunity to demonstrate them wherever you may be. For this reason, we who remain feel better about all the uncertainties and difficulties facing you who are graduated today. Whether you serve your country in the military services or in civilian posts, whether you pursue your career in peace or in cold or hot war, we are confident that you will serve in the great tradition of this institution and in the manner of men competent and anxious to work for a higher standard of living together, for an uncompromising defense of our free society, and for a free and peaceful world. If we in the United States are to be successful in our uncompromising hostility to Communism, we must have these qualities of faith and commitment and idealism in our citizens.

Needed: A New Perspective

I once heard of a perfectly sane man who was seen standing on his head in front of a table on which there was a bowl of fruit. This man, who was an artist, explained his novel position by saying that he had been looking at the bowl of fruit for so long from the same angle that he was no longer really seeing it. He was merely seeing what his mind had already accepted as being what a bowl of fruit looked like. So it is with your point of view about your career, or M.I.T., or the world about you. What I have been trying to suggest is that all of us need to stand on our heads occasionally to get a different view. We can, if we so choose, take a limited view by making up our minds that we are living in a world that offers little opportunity for individual achievement. If we have that picture in our minds, we can easily go through life finding evidence to prove that we are right and justifying to ourselves a life of soured outlook and small achievement. Or, if we feel that life would have no meaning for us unless we set high goals and find opportunity to advance toward those goals, then this very attitude will help us create a world in which we will find the opportunities we seek.

One final comment on your point of view as M.I.T. graduates. Going through M.I.T. may be likened to climbing a mountain. You plod up the trail with head down, watching only the way underfoot. At long last you reach the tree line and then you pause and look outward, suddenly discovering that your world has changed, that its ravines, ridges, and contours begin to shape up, and the path ahead is apparently leading somewhere.

And so today you reach the tree line of your career with a sweeping view spread out before you. If the peak is still obscured by clouds of uncertainty, you have reason to be sure that you can still scale it. We who have been your companions and guides up to this point send you along up the increasingly difficult trail, hope that the view will steadily widen, and bid you good climbing and Godspeed.

Commencement and Alumni Day, 1951

Godfrey L. Cabot, '81, takes a bow at the Alumni Day luncheon in celebration of his 70th anniversary of graduation from "Boston Tech."

EVENTS of commencement and Alumni Day, 1951, were marked by lofty idealism as James R. Killian, Jr., '26, President, reported on the explosive progress and development which have taken place at M.I.T. during the postwar period, and as the Honorable Harold R. Medina, Judge of U. S. District Court for Southern District of New York, delivered to the graduates an exceptionally inspiring commencement address on character building. But the tones of national uncertainty and indecisive leadership were also reflected in the year-end activities. In an effort to counteract inaccurate and misguided statements of overcrowding in the engineering profession, Karl T. Compton, chairman of the M.I.T. Corporation, President Killian, and Thomas K. Sherwood, '24, Dean of Engineering, on separate occasions called attention to the nation's pressing need for technically trained personnel – a need which could well be described as hysterical. In outlining the merits of the Marshall Plan at the Alumni Day Banquet, Richard M. Bissell, Jr., Deputy Administrator of the Economic Cooperation Administration, could not refrain from calling attention to the frustration and the defensive position which characterize so many in the nation's capital.

This year the events at the end of the school year included several innovations. For the first time in many years, the traditional Class Day exercises in Walker Memorial were omitted. An attractive and highly successful feature, to the 2,000 persons who participated, was the informal buffet luncheon in Du Pont Court for graduates, their families, and friends – immediately following the commencement exercises in Rockwell Cage. Alumni Day, 1951, was without the symposium of informative papers which were features of many past Alumni gatherings in Cambridge. Instead, President Killian presented his annual message on the "State of the Institute," following the informal luncheon in Du Pont Court. This precedent made it possible for wives and friends to join M.I.T. Alumni in obtaining firsthand information regarding progress at the Institute during the past school year. As a final innovation, at the Alumni Day Banquet Marshall B. Dalton, '15, general chairman of the Development Program, presented the final report on the Committee on Financing Development, whose program exceeded by nearly 30 per cent the $20,000,000 goal which had been set in 1948 to fund the Institute's independence.

Senior Week Activities . . .

For the graduating class, Senior Week marked the activities during which those who had spent four years at the Institute would be able to gather together for the last time, as a complete group, to engage in lighthearted entertainment at the end of student ca-

Officers of the Class of 1951 are (left to right): Edward E. Hucke, Third Marshal; Paul H. Grady, First Marshal; Arthur A. Wasserman, President; Stanley J. Marcewicz, Secretary; Marvin L. Baker, Second Marshal.

All M.I.T. Photos

Representing the distaff side of this year's graduates from Technology were (left to right): Margaret E. Irby, Rachel M. Goetchius, Eleanor L. Semple, Margaret T. Coleman, Priscilla M. Maurer, and Eva T. Browder, all of whom took part in the baccalaureate procession.

Left: *Prior to commencement exercises, Judge Harold R. Medina enjoyed an informal chat with President Killian, Thomas K. Sherwood, '24, Dean of Engineering, Karl T. Compton (back to camera), and George R. Harrison, Dean of Science.* Right: *Members of the Corporation in academic robes are (left to right): Walter Humphreys, '97, secretary of the Corporation; Pietro Belluschi, Dean of the School of Architecture and Planning; C. George Dandrow, '22; Luis de Florez, '11; Harold Bugbee, '20; Vannevar Bush, '16; Thomas D'A Brophy, '16; A. Warren Norton, '21; Harry J. Carlson, '92; Professor Emeritus William Emerson; and Godfrey L. Cabot, '81.*

reers of successful accomplishment. The events of Senior Week began with the annual senior ball at the Hotel Statler on Friday, June 1, and continued until commencement on Friday, June 8. On Saturday, June 2, the graduating class enjoyed its senior cruise in Boston Harbor, which event was followed by an outing for the seniors and their lady guests at Crane's Beach in Ipswich on June 3. Rockwell Cage was the scene of the senior banquet on Tuesday, June 5.

Baccalaureate Service . . .

When, in cap and gown, the graduates had been photographed on the steps of Building 10 in the bright, warm sunlight of Thursday, June 7, the members of the Class of 1951, led by class officers, marched down Memorial Drive to Walker Memorial to attend their baccalaureate service. The procession along Memorial Drive was led by Arthur A. Wasserman of Brooklyn, N.Y., Class President; Stanley J. Marcewicz of Somerville, N.J., Class Secretary; Paul H. Grady of Watertown, Mass., First Marshal; Marvin L. Baker of Passaic, N.J., Second Marshal; and Edward E. Hucke of Kansas City, Mo., Third Marshal. Following in close order, the feminine contingent in the procession included Margaret E. Irby, Rachel M. Goetchius, Eleanor L. Semple, Margaret T. Coleman, Priscilla M. Maurer, and Mrs. Felix E. (Eva T.) Browder.

With Philip M. Richardson, '26, at the organ, the Reverend Dana McLean Greeley, minister of the Arlington Street Church in Boston, led the call to worship, and President Killian gave the Scripture reading from I Corinthians 13:1-13. With members of their families and key figures in the Institute's Faculty and Administration, the Class of 1951 filled Walker Memorial to listen to an inspiring address by the Reverend Sidney Lovett, chaplain of Yale University. His address, "Tradition and Progress," appears on page 479 in this issue of The Review.

Commencement . . .

Friday, June 8 – better known as commencement day, especially to the young persons taking part in it– beamed bright and clear as the Institute held its 85th

A new feature of commencement day was the informal buffet luncheon in Du Pont Court, attended by the graduates with their families and friends. Illustration at the left shows a group entering the tented dining area. At the right, Dr. Compton makes a few informal remarks to friends of the graduates.

Seated at the head table at the President's Luncheon, for members of the 50-year Class and honored guests, were (left to right): Godfrey L. Cabot, '81; Mrs. Theodore H. Taft; Professor Herbert B. Dwiht, staff; Mrs. Vannevar Bush; Mrs. Harold R. Medina; Philip W. Moore, '01; President Killian; Mrs. Philip W. Moore; Judge Harold R. Medina; Karl T. Compton, standing and speaking with Vannevar Bush, '16; Mrs James R. Killian; Mrs. Herbert B. Dwight; and Theodore H. Taft, '01 (at end of table). Right: *A smaller group at the same luncheon included, in clockwise order, Mrs. John A. Lunn; Mrs. Julius A. Stratton; Julius A. Stratton, '23; Charles A. Record, '01; Mrs. Albert W. Higgins; and Albert W. Higgins, '01, addressing A. Warren Norton, '21.*

commencement exercises. For members of the M.I.T. Corporation who attended breakfast at Dr. Compton's residence at 100 Memorial Drive, Cambridge, events of the day began at the early hour of 8:00 A.M. Two hours later, the Cambridge Armory, opposite the main M.I.T. buildings on Massachusetts Avenue, was the scene of robing for all who took part in the commencement procession.

Led by John A. Lunn, '17, President of the Alumni Association, the academic procession left the Cambridge Armory and entered nearby Rockwell Cage at 10:30 A.M. with guests of honor, members of the M.I.T. Corporation, members of the Class of 1901, officers of the Class of 1926, Faculty members, and last, but most important, the 1,178 graduates who were to receive 1,211 degrees and 274 reserve commissions in the United States Army and Air Force.

Ceremonies were opened with the singing of the "Star Spangled Banner," with Harry U. Camp, '18, at the organ; then followed the invocation, given by the Reverend Dwight C. Smith, pastor of the Mount Vernon Church of Boston.

The inspiring commencement address to the graduates was delivered in a direct, forthright, human manner by the Honorable Harold R. Medina, Judge of United States District Court for Southern District of New York, who, three days later, was appointed by President Truman to succeed Learned Hand on the United States Court of Appeals for the Second Circuit. Judge Medina's address, studded with personal anecdotes, appears on page 476 of this issue of The Review under the title "Character Building — The Job of a Lifetime." His remarkable patience and fastidious objectiveness in the trial of Communist agents (covering a period of nine months) assured Judge Medina of a sympathetic and friendly audience. But it was the warm personality and simple directness of a man of outstanding character that caused his audience of 5,000 persons to acclaim the address by rising to their feet at its conclusion.

Major Lyman R. Blake, Associate Professor of Air Science and Tactics, administered the oath of office to 55 members of the Officers' Reserve Corps and to another 119 members of the Air Force Reserve. Karl

School and class loyalty is reflected by Carole A. Clarke, secretary of the Class of 1921, whose automobile license plate is shown at the left. Center illustration shows a group of Alumni picking up their advance registration tickets. On the right is the 1951 stein, designed, as usual, by Henry B. Kane, '24.

Below: *In clockwise order, from end of table, are: D. Leighton Ordway, Albert W. Higgins, Mrs. Higgins, Edwin F. Church, Jr., William E. Farnham, Edward Seaver, Willard W. Dow, W. Cornell Appleton, Mrs. Nutter, Alfred DeW. Nutter, and Norman A. Dubois—all members of the Class of '01 at the Alumni Day luncheon.*

At the 60-year Class table for the Alumni Day luncheon were, in reading order: (standing) Edward Earl, '91; John L. Damon, '91; Arthur W. Pierce, '91; Carl H. Bunker, '91; Frank W. Howard, '91; and Harry H. Young; '91; (seated) Alan A. Claflin, '94; Charles J. David, '00; Robert M. Derby, '01; Edwin B. Bartlett, '06; and Samuel S. Dearborn, '84.

T. Compton, chairman of the M.I.T. Corporation, made the presentation of degrees, and Major General James P. Hodges, Commanding General of the First Air Force, made the presentation of the commissions to R.O.T.C. students.

The Review is proud to print, on page 481 of this issue, President Killian's farewell address to the graduates of 1951.

The 1,178 candidates for degrees represented the second largest class ever to graduate from the Institute, being exceeded only by the Class of 1950 in which 1,225 candidates received degrees. At this year's exercises, the candidates received a total of 1,211 degrees, since 29 received both the S.B. and the S.M. degrees and four received two S.B. degrees. Doctorates went to 82 persons; of whom 43 received the Ph.D. and 39 took Sc.D. degrees. Advanced engineering degrees went to 53, and a total of 253 master's degrees were awarded. Bachelor's degrees totaling 823 were also presented.

Thirteen young women, the largest number graduated for several years, were among the candidates for degrees. Mrs. Felix (Violet B.) Haas of Cambridge and Emily L. Wick of Youngstown, Ohio, received Ph.D. degrees; their fields were mathematics and organic chemistry, respectively. Beverly J. Beane of Fitchburg, Mass., Anne A. Gillis of Boston, and Marion E. Ford of Littleton, Mass., received master's degrees in aeronautical engineering, chemistry, and city planning, respectively. Bachelor's degrees were conferred upon Anne C. Bickford of Cambridge, Eleanor L. Semple of Rumford, R.I., Rachel M. Goetchius of Quincy, Mass., Priscilla M. Maurer of Margaretville, N.Y., Mrs. Felix E. (Eva T.) Browder of Brookline, Mass., Margaret T. Coleman of Cambridge, Margaret E. Irby of Ponca City, Okla., and Maria-Luise R. Azzarone of Forest Hills, N.Y.

Commencement Day Luncheon . . .

Following these heart-warming exercises, a commencement luncheon in Du Pont Court for seniors and their guests marked a pleasant and most welcome innovation in this year's events. A buffet luncheon was served to approximately 2,000 members of the graduating class and their families in the first affair of this kind which provided graduates their last opportunity to say farewell before embarking on careers in science, engineering, architecture, administration, public health, or perhaps in academic halls. At the conclusion of the luncheon, Mr. Wasserman and Dr. Compton (forsaking his official role this year for that of proud parent of an M.I.T. graduate) addressed the graduates and their friends. Shortly thereafter, scores of cameras clicked in the Great Court to catch many of

Left: *At the head table at the Alumni Day luncheon were (left to right): Paul M. Chalmers, Assistant Director of Admissions; Robert M. Briber, President of the Class of 1952; Mrs. John M. Nalle; Theodore H. Taft, '01; Mrs. Paul M. Chalmers; and Georges F. Doriot.* Right: *Mrs. John A. Lunn; Philip W. Moore, '01; Mrs. Harold H. Burton; Karl T. Compton; Mrs. Albert Chambon; and John A. Lunn, '17.*

the fresh crop of M.I.T. Alumni in cap and gown and armed with documentary evidence attesting to their professional competence. Omitted this year were the traditional Class Day ceremonies of accepting the graduating class into the Alumni Association of M.I.T. – with the passing of the beaver ring to the officers of the new Senior Class. But no one could doubt that the new graduates were as loyal in their support of their alma mater as any of their forerunners whose departure from M.I.T. has been customarily and officially marked by Class Day exercises.

As the graduates and their families partook of luncheon in Du Pont Court, President Killian was host at the luncheon for the guests of honor and the 50-Year Class, which was held in the Everett Moore Baker House. Long in tradition is the practice of paying special recognition to members of the 50-year Class, whose numerous years of achievements and positions in life may well be pointed out to the graduates as matters to emulate. As a group, this Class indeed represents the "Elder Statesmen" of past generations of college graduates. But the 50-year Class was counted as merely a happy, pleasant group of young people to Godfrey L. Cabot, '81, a member of the M.I.T. Corporation celebrating the 70th anniversary of his graduation from M.I.T. Dr. Cabot is also a member of the Alumni Council, and at those meetings, which he nearly always attends, his sharp wit and keen observation have not often been outmatched by others who are decades his junior.

As final conclusion to the events of commencement day, President and Mrs. Killian – with Dr. and Mrs. Compton, and Mr. and Mrs. Lunn in the receiving line – held a reception for seniors and their guests in Walker Memorial. Each of the Institute's courses had its "recruiting station" at one of the stately columns in Morss Hall where professional, or family, talk could be centered around course activities. The program called for dancing, and an excellent orchestra was on hand. But so well attended was the reception that sparse space of Walker's smooth floors remained available for that scheduled activity.

Honorary Secretaries Meet . . .

At 4:30 P.M. on Sunday, June 10, some 200 Honorary Secretaries and members of the Institute's family held their annual meeting and dinner at the Braeburn Country Club in Newton. Throughout the years, since the Institute has had an able corps of mature Alumni serving to interview applicants for admission, the dinner meetings of the Honorary Secretaries have become an increasingly important part of the events associated with commencement and Alumni Day. As in the past, this year the meeting was characterized by hard work, good fellowship, and pleasant sociability.

The Honorable Harold H. Burton, son of Dean Burton, President Killian, and Mrs. Harold H. Burton at dedication exercises naming the new dormitory for the late Alfred E. Burton (shown in the oval inset) who served as the first dean of students between 1902 and 1922.

As chairman of the meeting, Julius A. Stratton, '23, Provost of the Institute, gave advance notice of several new posts which have been created at M.I.T. He recalled the appointment of Walter H. Gale, '23, as Institute Secretary (Technology Review for June, page 410); announced the appointment of Ralph T. Jope, '28, to head the permanent Development Office; and reported that Thomas P. Pitré, Dean of Freshmen, had accepted additional responsibilities and would fill a new post as director of student aid. Both of these appointments are recorded in the Institute Gazette section of this issue.

B. Alden Thresher, '20, Director of Admissions, was invited to address the Honorary Secretaries on problems which the Institute is encountering in recruiting new students. Professor Thresher opened the discussion by explaining why M.I.T. has the problem of recruiting students, when the Institute has limited enrollment, by pointing out that the objective of the Admissions Office is not primarily to obtain more stu-

Also at the Alumni Day Luncheon, left to right across both illustrations, were: Albert Chambon, Consul General of France; Mrs. Karl T. Compton; Justice Harold H. Burton; Mrs. James R. Killian, Jr.; Alfred T. Glassett, '20; Mrs. Philip W. Moore; Godfrey L. Cabot, '81; Mrs. Felix A. Burton; Julius A. Stratton, '23; Mrs. Georges F. Doriot; Mrs. Theodore H. Taft; and John M. Nalle, '20, chairman of the Alumni Day luncheon.

dents, but to improve the caliber of freshmen entering M.I.T. Professor Thresher reviewed the program which the Admissions Office is following to reach this objective, with competition from other colleges. Increased travel in which members of that office have engaged, made it possible for M.I.T. personnel to visit some 400 high and preparatory schools last year in making personal contact with 2,600 students. Increased awards to freshmen who merit scholarships are now making it possible for some students to attend M.I.T. who might otherwise be prevented from so doing by reason of the high cost. But most of Professor Thresher's talk centered about a tentative proposal to supplement the very effective and valuable work which the Honorary Secretaries are carrying out, and he invited full discussion on this point.

In the last year, the Admissions Office has given consideration to augmenting the 275 Honorary Secretaries by enlisting the aid of a select group of

An informal reception was held at the president's house and garden on the afternoon of Alumni Day.

Alumni who would be willing and able to interview high and preparatory school students desiring to study at M.I.T. Adequate contact with such students is now possible in the large metropolitan areas, but it is felt desirable to develop better contact with the Institute in small towns and rural areas. The Honorary Secretaries can play a major and exceedingly important role in training entrance counselors whose selection could be greatly facilitated by co-operation from M.I.T. Alumni Clubs throughout the country, since M.I.T. club members have knowledge of local alumni personnel and educational conditions. Honorary Secretaries from various parts of the country entered into a full discussion of this proposal.

Following dinner, President Killian called upon several Honorary Secretaries, especially those from distant points, to say a few words; and Dr. Compton spoke on the need, particularly during the present national emergency, to increase the supply of scientists and engineers. He pointed out that the need for technically trained personnel was almost hysterical in certain fields, and that the normal postwar demand for engineers was likely to be several times the number which would be graduated during the next three or four years. The importance of counteracting the Department of Labor's erroneous estimate of overcrowding in the technical professions was emphasized.

Alumni Day—June 11 . . .

Topcoats were in order on Alumni Day, Monday, June 11, when more than 1,000 Alumni returned to M.I.T. to take part in departmental forums and reunions, to listen to the dedication of the Alfred E. Burton House, to partake of the informal buffet luncheon in Du Pont Court at which President Killian presented his "State of the Institute" address, to attend a reception at the President's House, and finally to conclude the day's events at the Copley Plaza Hotel in Boston for the popular Stein-on-the-Table Banquet.

Long tables in the lobby of Building 7, efficiently manned by personnel from the Alumni Office, facilitated registration for the newcomers and those who had registered in advance. Between 10:30 A.M. and noontime, departmental reunions and forums were held by 14 of the Institute's 20 courses, and these provided opportunity to renew acquaintances and to learn of recent progress in the departments.

Dedication of the Burton House . . .

Last year the Institute acquired title to the Riverside Apartment Hotel on Memorial Drive, about three blocks west of Massachusetts Avenue. This five-story structure has been completely remodeled and serves as the newest and largest of the Institute's dormitories. In simple and effective ceremonies which took place at 11:30 A.M., this new dormitory was dedicated and renamed the Burton House, "in honor of Alfred Edgar Burton, professor of topographical engineering, 1882 to 1922, and first dean of the Institute, 1902-1922, founder of student government and the dormitory system, a man beloved by every student and alumnus during his years at the Massachusetts Institute of Technology." Participants in the dedication ceremonies, which were attended by members of Dean Burton's family, were President Killian, Dr. Dana L. Farnsworth, Acting Dean of Students, and Nicholas Melissas, '52, chairman of the Dormitory Committee. The Honorable Harold H. Burton, Associate Justice of the Supreme Court, and son of Dean Burton, received from President Killian a diptych containing the in-

Members of Dean Burton's family were among the honored guests at the Alumni Day luncheon. In clockwise order, beginning at opening at near corner of table, were: Michael Demetrios; Hans Peterson; William Braillard; A. B. Demetrios; Mrs. F. B. Braillard; A. R. Burton; Mrs. George Demetrios; Dana L. Farnsworth, Acting Dean of Students; George Demetrios; Mrs. Farnsworth (partly hidden); Frederick G. Fassett, Jr., director of publications; Mrs. George R. Harrison; Mrs. A. R. Burton; Mrs. Fassett; Ellen Fassett; and George R. Harrison, Dean of Science and newly elected Honorary Member of the Alumni Association.

Honored guests at the Stein-on-the-Table Banquet included (left to right, across both panels): Allen Latham, Jr., '30; H. E. Lobdell, '17; Rudolf F. Haffenreffer, '95; Marshall B. Dalton, '15, recently elected Honorary Member of the Alumni Council; Albert W. Higgins, '01; James R. Killian, Jr., '26; Karl T. Compton; Richard M. Bissell, Jr.; David A. Shepard, '26; Philip W. Moore, '01; and Alfred T. Glassett, '20.

scription quoted above, which also appears on a bronze tablet in the entrance of Burton House.

Luncheon . . .

At 12:30 P.M., Alumni congregated in Du Pont Court for the buffet luncheon, protected against cool winds and the threat of rain by tents and canvas side walls. Since Alumni Day, 1935, when the Institute embarked upon its annual Alumni Day reunions, these informal luncheons (inaugurated in 1936) have been an important and delightful part of the day's events. Again this year, as during the past 16, former classmates could get together for an informal gathering; they could reminisce about their days at the Institute, or concern themselves with the futures of their sons, or daughters, who had taken part in the commencement exercises a few days before. They could, and some did, take pains to call on a favorite professor to show that the intellectual guidance of a former day was not without recognition and present-day appreciation. The younger classes could look forward to future success in professional and family life, and members of older classes could contemplate their thinning ranks with the satisfaction of having lived their years in accomplishment.

The outdoor addresses which followed the luncheon were an innovation this year. Presiding at this new event was Mr. Lunn, 1950–1951 President of the Alumni Association, who introduced Alfred T. Glassett, '20, President-elect of the Alumni Association, and other distinguished guests.

Albert Chambon, Consul General of France, honored Dr. Compton by conferring upon him the distinction of Officer of the Legion of Honor. In making the presentation, Monsieur Chambon said:

In a world where misunderstandings are many, he [Dr. Compton] has done much to create an atmosphere of mutual comprehension. He has sponsored the exchanges between our two countries of technicians and scientists. He has not only created this common front of scholars but carefully and competently guided the activities of the high spheres in which they work. He has also played an outstanding role, in the past years, in the forging of those ties of friendship that bring nations into close harmony of spirit. The French Government in honoring him recalls also the eminent services that he rendered in the defense of its country during the first world war. Finally, France wishes to honor Dr. Compton who, as a great American scientist and leader, has been a most distinguished benefactor of the human cause.

Dr. Compton's response, first in French and then in English, expressed his happiness in receiving the distinction and acknowledged the debt which this country owes to French education. He recalled that the concepts in technical education which led to the creation of M.I.T. could be traced back 150 years to the establishment of Ecole Polytechnique in Paris.

President Killian established a new precedent by delivering his "State of the Institute" address as a conclusion to the outdoor events of the informal luncheon. In years past, this important presidential message has been delivered at the Stein-on-the-Table

Tables for the 25- and 50-year classes were well attended at the Alumni Day Banquet. At one Class of '26 table were (named in clockwise order, beginning at left foreground): George W. Wardner, Dominico Sicari DeAmicis, Martin J. Bergen, Edward N. Roberts, William W. Donnell, Robert T. Dawes, Charles S. Draper, Alfred H. Dolben, William F. Rivers, George Warren Smith, and Chenery Salmon, all of the Class of 1926. For the 50-year table, in the same order, were Ralph C. Robinson (back to camera), George V. Sammet, D. Leighton Ordway, John Boyle, Jr., L. Herbert Bigelow, Theodore H. Taft, Anna B. Gallup, Grace Macleod, Norman A. DuBois, and Edwin F. Church, all of the Class of '01.

Of several tables occupied by the Class of 1936, this one included (in clockwise order, from opening at center foreground): Edward S. Halfman, Martin A. Gilman, Richard K. Koegler, Lawrence G. Peterson, Ariel A. Thomas, Mrs. George E. (Alice Hunter) Kimball, Edward B. Rowe, Jr., Richard Halloran, Roman I. Ulans, and Gerard Chapman.

Banquet where attendance was necessarily restricted to M.I.T. Alumni because of limitations of banquet facilities in Boston.

State of the Institute . . .

Some of the items on which President Killian reported have already been mentioned in the pages of The Review. For this reason the following condensation of his address is edited to emphasize those topics which have not been previously treated in these pages, or which, for one reason or another, might well be re-emphasized. Said Dr. Killian:

In making my annual report on the state of the Institute, I am confronted with two problems. The first is a problem of selection, because so much has happened at the Institute that it is impossible in a limited time to give you an exhaustive report. The second problem is what kind of reference point or landmark to take in order to indicate that the ship is moving in the right direction. Perhaps both of these problems can be solved by drawing some quantitative comparisons of the M.I.T. of 1951 with the M.I.T. at the end of World War II. What has happened to our institution in the period of reconversion, reconstruction, and cold war in which we have been living since 1946?

Quantitative comparisons show clearly that we witnessed a great surge of energy and change at the Institute. Take, for example, our physical facilities. Since the end of the war we have constructed, or started the construction of, over 1,000,000 square feet of space – an increase in the size of our plant of approximately 50 per cent. New living and recreational facilities for our students include: Westgate and Westgate West for married students; and Baker House and Burton House, two dormitories which have supplied accommodations for nearly 1,000 additional students to our housing system. We have built the Rockwell Cage, the greatest single addition to our athletic facilities in the history of the Institute, and we have made available an additional three acres of playing space.

Faculty and staff members who attended the Stein-on-the-Table Banquet (beginning with foreground opening, and in clockwise order) included: Frederick Hartwell, James W. F. MacDonald, Horace S. Ford, Delbert H. Rhind, Dana L. Farnsworth, Gordon S. Brown, '31, Thomas P. Pitré, Richard F. Koch, Albert W. Bridges, and Frank M. Baldwin.

To our educational and research facilities we have made many notable additions, of which the largest, and in many ways the most significant, has been the Charles Hayden Memorial Library, which is serving so effectively our program in general education. In addition there has been the construction of the Gas Turbine Laboratory, the Hydrodynamics Laboratory, which was dedicated on June 4, the Supersonic Wind Tunnel, and the Alfred P. Sloan Building. The Sloan Building will fill many important needs for the Institute in addition to being the center for the School of Industrial Management. It will house, for example, a Faculty Club, a really adequate and attractive center for our staff. The adaptation of the top floor of the Sloan Building and of the penthouse will be carried out this summer and early fall, and it is our hope that our Faculty Club will be available for use by late fall. In addition to the Sloan Building, we have during the past year started the construction of the Metal Processing Laboratory, made possible by a gift of $1,000,000 from Alfred P. Sloan, Jr., '95, and the John Thompson Dorrance Laboratory for Biology and Food Technology, made possible by the gift of $1,000,000 from the Campbell Soup Company. It is our hope that both of these laboratories will become available during the coming academic year.

To the structures which I have mentioned should be added the new 12,000,000-volt electrostatic generator, now being constructed; the Barta Building, several blocks up Massachusetts Avenue which houses a great new computing machine; the Lexington Field Station; and the Whittemore Buildings, just to the north of our present campus, which will be used for sponsored research. Still other pieces of property have been acquired by the Institute as investment properties, including the R. H. White Building located on Memorial Drive at the end of Boston University Bridge, and the Tech Block on Massachusetts Avenue across from our main buildings.

The increase in physical plant in this postwar period has been reflected, of course, in the value of our plant and equipment. As we went into World War II, this value totaled about $16,750,000. It now stands at $28,000,000. In the last normal year before the war the Institute's operating budget was about $3,750,000. In the year just coming to a close, this budget will exceed $23,000,000. Over this same period the Institute's total invested funds will have grown from $36,000,000 to $54,000,000; its academic staff from 681 to 1,300; and its student body from 3,100 to 5,100.

Such are some of the comparisons which show the almost explosive growth and development of the Institute since the war. Such comparisons, however, are important only in the degree in which they suggest what has

(*Continued on page 506*)

THE INSTITUTE GAZETTE

PREPARED IN COLLABORATION WITH THE TECHNOLOGY NEWS SERVICE

M.I.T. Photos

Recent administrative appointments at the Institute give to Thomas P. Pitré, Dean of Freshmen (left), *new responsibilities as director of student aid; to Professor Nathaniel H. Frank, '23* (center), *the post of acting head of the Department of Physics; and to Professor John C. Slater* (right), *the distinction of being the first Institute Professor in a newly created post which provides unusual freedom for study and research at the Institute, unhampered by departmental boundaries.*

Institute Professorship

FOR more than 20 years Head of the Department of Physics at Technology, John C. Slater has been appointed to the newly created post of Institute Professor, President Killian announced shortly after Alumni Day.

Professor Slater, who had indicated a desire to be freed from administrative responsibilities in order that he might concentrate more intensively on research and teaching, will continue to be attached to the Department of Physics, but will be free as an Institute Professor to work throughout Technology unhampered by departmental boundaries. His primary concern in the immediate future will be with matter in the solid state, a field in which he has for many years been an outstanding authority; and he will be active in the co-ordination of investigations throughout the Institute having to do with the structure of matter.

To facilitate his entry into his new responsibilities, Professor Slater has been granted a leave of absence for the coming year to carry on research at Brookhaven National Laboratory on Long Island, of which M.I.T. is one of the sponsoring institutions.

Professor Nathaniel H. Frank, '23, has been appointed acting head of the Department of Physics, to serve until Professor Slater's successor has been selected. Professor Frank has had a distinguished teaching and research career in the Radiation Laboratory at the Institute. He is coauthor, with Professor Slater, of *Introduction to Theoretical Physics* and has also written two introductory volumes on college physics.

Director of Student Aid

THOMAS P. PITRÉ, Dean of Freshmen at the Institute, has been appointed to the new administrative post of director of student aid, as announced by President Killian. While continuing to serve as dean of freshmen, in his new post Dean Pitré will also be chairman of the Faculty Committee on Student Aid.

In making the announcement, President Killian said that the general objective of the director of student aid and his organization will be to formulate and recommend policy governing the Institute's student-aid and student employment program, and to coordinate and direct the management and awarding of scholarships and loans.

The new plan is expected to provide individual, tailor-made aid to students, some of whom would benefit most from part-time employment, and others from a combination of a job and a loan. Scholarship aid available to qualified students might also be supplemented by loans or part-time student employment to those requiring all three types of assistance, including scholarship aid. It will be within the discretion of the director to effect combinations of the various forms of student aid best calculated to serve the interests of the individual student.

Mr. Pitré has been a member of the Institute's staff since 1920. Born in 1898 in Waterbury, Conn., he received his early education in the public schools of Seymour, Conn. He was graduated *cum laude* from Amherst College in 1919 with the degree of bachelor of arts. Before coming to M.I.T. he served for a year as an instructor at Phillips Andover Academy.

M.I.T. Photo

Ralph T. Jope, '28

. . . will continue to serve The Technology Review as its able business manager in addition to his new duties as director of the Development Office.

Jope Heads Development Office

At the Alumni Day Banquet on June 11, Ralph T. Jope, '28, was named by President Killian to the post of director of the M.I.T. Development Program Office. This office, which served as headquarters for the M.I.T. Committee on Financing Development during its recent $20,000,000 drive, is now established on a permanent basis.

Mr. Jope, who acted as assistant to the general chairman, Marshall B. Dalton, '15, during the intensive phase of the fund-raising activities of the past two years, will have direct responsibility for the Institute's long-range development program. The basic objectives of this continuing development program are to increase the Institute's capital resources and to insure adequate annual funds to support current operations in the fields of education and research. This broad program of developing the financial resources of the Institute will involve the combined efforts of its Administration, Alumni, and Corporation. As director of the Development Office, Mr. Jope will be responsible for the tactical planning and co-ordination of the fund-raising activities of these various groups, and for the implementation of basic policies established by them.

Mr. Jope was graduated from M.I.T. in 1928 and is business manager of The Technology Review, a post which he will continue to hold He is a former treasurer of the M.I.T. Alumni Association, and from 1934 until 1947 he was a member of the Advisory Council on Athletics at Technology.

Edward L. Moreland: 1885-1951

Edward L. Moreland, '07, retired Executive Vice-president of the Institute, died suddenly at his summer home in West Falmouth, Mass., on June 17, at the age of 65.

Dr. Moreland was a native of Lexington, Va., and was educated at Johns Hopkins University and M.I.T. In addition to his association with the Institute, he was for many years a member of the engineering firm of Jackson and Moreland. During the years of his devoted service to the Institute from 1935, when he became head of the Department of Electrical Engineering, until his retirement as executive vice-president of the Institute in 1950, Dr. Moreland's wide experience in engineering and his characteristic thoroughness and well-considered judgment were of enormous value to Technology in almost every phase of its administration. Having served as head of the Department of Electrical Engineering from 1935 to 1938, Dr. Moreland was then appointed dean of engineering and held that post until his appointment as executive vice-president in 1946.

In addition to many important wartime activities, he served from 1942 to 1945 as executive officer of the National Defense Research Committee in the Office of Scientific Research and Development. During this period he was a consultant to the secretary of war and was assigned to the South Pacific theater as chief of the Scientific and Technical Advisory Committee. After the surrender of Japan he was head of the Scientific Intelligence Survey sent to Japan to study the Japanese organization for scientific war research. On this mission he was accompanied by Dr. Compton. For his services he was awarded the Medal of Freedom and this was followed by the Medal for Merit, which was bestowed by President Truman in 1948. During World War I he served as a captain and later as a major of engineers in the American Expeditionary Force; and, following the Armistice, he was appointed head of a mission to determine German indemnity for war damage in Belgium.

Dr. Moreland was active in Alumni affairs, having served as president of the Alumni Association for the year 1935-1936.

M.I.T. Photo

Edward L. Moreland, '07

. . . distinguished Alumnus who served the Institute as head of the Department of Electrical Engineering, dean of engineering, and executive vice-president.

Council Business

Sitting for its 283rd meeting on May 28, the Alumni Council devoted a substantial portion of its deliberations to end-of-the-year business activities. Presiding at the meeting, held in the Graduate House, was John A. Lunn, '17, President of the Alumni Association, who announced the results of the spring election of the Alumni Association (see The Review for June, page 411) and introduced the Alumni officers for the

coming year, as well as two honorary members and nine past presidents of the Association.

Visits to 14 Technology clubs, as far away as Rochester, N.Y., and Pittsburgh, Pa., by 16 members of the Council and M.I.T. staff, were reported as having been made during May. In an afternoon meeting on May 28, the Executive Committee nominated personnel for various committees, and the slate was formally approved by a vote of the Council. President Lunn also announced that Marshall B. Dalton, '15, had been elected the fifth honorary member of the Alumni Council, although Mr. Dalton found it impossible to attend the Council meeting to witness the wholehearted enthusiasm elicited by this report.

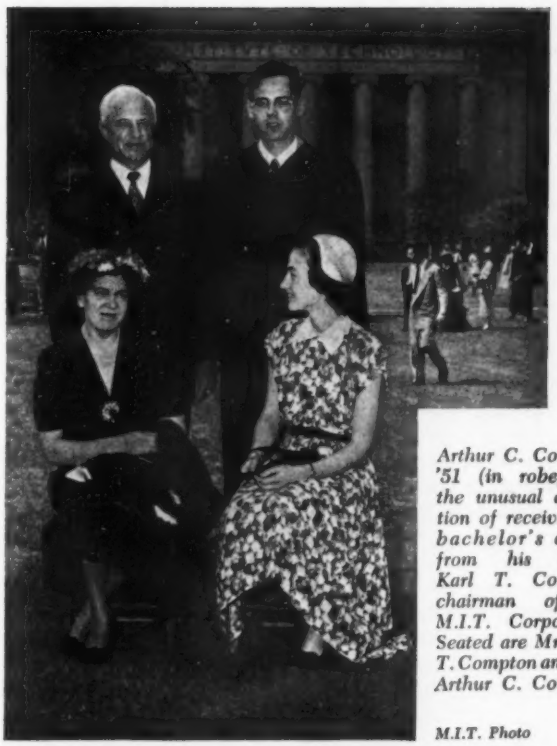
Bringing the monthly message from the M.I.T. Administration was President Killian, who announced to members of the Council the recent appointments of Walter H. Gale, '29, as Secretary of M.I.T., Ralph T. Jope, '28, as head of the permanent Development Office, and of Frederick G. Fassett, Jr., as director of publications at the Institute, all of which appointments are recorded in the June issue or this month's issue of The Review. President Killian also introduced Professor Gale who spoke briefly of the work which he envisions for his new post.

Upon introduction by President Lunn, Professor Rolf Eliassen, '32, of the Department of Civil and Sanitary Engineering, spoke of the extensive research project now being conducted for the Atomic Energy Commission in the Institute's William Thompson Sedgwick Laboratories of Sanitary Science. This project involves the removal of radioisotopes from water by procedures within the realm of possibility of municipal and industrial water supplies. Professor Eliassen also discussed the various sources of radioactive contamination, the nature of the contamination, and the problem it may create in water supplies. It is common for the waterworks engineer to remove 250 of the 300 parts per million of undesirable substances in water. However, with radioactive contaminants, low orders of magnitude never before encountered are involved. The recommended permissible level of radioiodine, for example, is less than 3×10^{-10} part per million. In the new addition to the sanitary engineering laboratories at M.I.T., some of the answers are being provided for questions regarding the removal of hazardous contaminations of radioactivity from water supplies.

Humanities Scholarships for Engineers

THE creation of the new School of Humanities and Social Studies at M.I.T. has stimulated the establishment of scholarships, valued at $500 each, to be awarded to two seniors whose records indicate exceptional promise. The scholarships were established this year by Harry A. Kuljian, '19, prominent Philadelphia engineer and head of an internationally-known engineering firm. The purpose of the scholarships is to assist the recipients to broaden their education in the field of the humanities and social studies, in order that they may gain a better understanding of human relations in applying their technical training.

The first awards of the Harry A. Kuljian Prize Scholarships for seniors are to be made to William P. Chandler, '52, a junior in the Department of Chemical Engineering, son of Mr. and Mrs. James K. Chandler of Cleveland, Ohio, and to Herbert M. Teager, '52, a junior in the Department of Electrical Engineering, son of Mr. and Mrs. Stephen R. Teager of Brooklyn, N.Y.



Arthur C. Compton, '51 (in robe), had the unusual distinction of receiving his bachelor's degree from his father, Karl T. Compton, chairman of the M.I.T. Corporation. Seated are Mrs. Karl T. Compton and Mrs. Arthur C. Compton.

M.I.T. Photo

In announcing the scholarships, Mr. Kuljian said: "The establishment of the School of Humanities and Social Studies marks a great forward step, and a much needed one, in the training of our engineers. The opening up of vast new opportunities all over the world makes it essential for the American engineer to have a general education in world affairs, traditions, economics, and human relations. Otherwise he cannot cope with many of the problems he must solve in other countries – problems which go beyond purely technical matters. . . . The scholarships . . . are intended to help promising engineering students to round out their training along these lines."

The tradition of American opportunity is vividly borne out in Mr. Kuljian's career. He arrived in America as an Armenian immigrant, and worked his way through schools until he had completed his professional training at Technology. After many years of diversified engineering experience, Mr. Kuljian established his own firm in 1930, and his organization has designed and constructed many large projects.

Death Takes Mrs. Maclaurin

MRS. RICHARD C. MACLAURIN, widow of President Maclaurin, with whom she shared profound devotion to the Institute and unstinting endeavor in its behalf, died on May 31 at Phillips House, Boston. Funeral services were held in King's Chapel on June 4.

Orowan Made Westinghouse Professor

THE appointment of Professor Egon Orowan as George Westinghouse Professor of Mechanical Engineering at the Institute has been announced by Thomas K. Sherwood '24, Dean of Engineering.

Dr. Orowan joined the Faculty of the Institute last June, and he now succeeds Professor William R. Hawthorne, '39, who has held the Westinghouse chair since 1948. Professor Hawthorne is resigning to accept the post of the Hopkinson and Imperial Chemical Industries Professorship of Applied Thermodynamics at Cambridge University in England.

One of the outstanding authorities in the general field of physics of metals, Dr. Orowan has made numerous contributions of great significance to the behavior of solids under stress. He was born in Budapest, Hungary, in 1902 and studied at the Technical University of Berlin-Charlottenburg, where he continued for some years as a teacher and research worker. He returned to Hungary and for some time was in charge of the Krypton Gas Works of the United Incandescent Lamp and Electric Company. In 1937, Dr. Orowan resumed his research work on the mechanical properties of metals in the physics department of the University of Birmingham in England. In 1939 he was associated with the Cavendish Laboratory under Sir Lawrence Bragg, where he was head of the metal physics group and reader in the physics of metals in the University of Cambridge.

Dr. Orowan is regarded as unique in his ability to combine fundamental knowledge of physics and metallurgy with the point of view of the mechanical engineer. He has received many honors, including the Thomas Hawksley Gold Medal of the Institution of Mechanical Engineers in 1945, and election as a Fellow of the Royal Society of London in 1947.

M.I.T. Photo

Representing the Alumni Association in the commencement day academic procession on June 8, were (left to right) Donald P. Severance, '38, Secretary and Treasurer, and John A. Lunn, '17, 1950-1951 President of the M.I.T. Alumni Association.

Albert H. Wiggin: 1868-1951

ALBERT HENRY WIGGIN, life member of the M.I.T. Corporation and financier who helped build the Chase National Bank into one of the world's largest commercial banks, died on May 21 at his summer home in Greenwich, Conn., at the age of 83.

Born in Medfield, Mass., on February 21, 1868, Mr. Wiggin received his early education in the Boston public schools and was awarded the LL.D. degree from Middlebury College, Kenyon College, and Columbia University. He began his financial career as a bank clerk in 1885 in Boston, was an assistant national bank examiner of the Boston district between 1891 and 1894, and became assistant cashier of the Third National Bank and later vice-president of the Eliot National Bank in Boston. He went to New York in 1899 as vice-president of the National Park Bank and joined the Chase National Bank as vice-president in 1904, subsequently becoming president and chairman of the board. He retired in 1933. For more than a quarter of a century, during World War I and the early depression years, Mr. Wiggin played a leading role in the expansion of the Chase National Bank into an international banking institution.

Mr. Wiggin was a director of many large corporations, a trustee of Middlebury College, and member of Two Hundred Fifty Associates of Harvard Business School. He became a life member of the M.I.T. Corporation in 1933.

Faculty Members Visit Japan

AT the request of the Supreme Commander for the Allied Powers, the American Society for Engineering Education and the Unitarian Service Committee, Inc., have jointly organized a Commission on Engineering Education to visit Japan this summer. Fifteen Americans — including four members of the Institute's Faculty — representing the principal areas of engineering education, will leave for the Orient in early July to consult with the Ministry of Education of the Japanese Government as well as with educators and administrators of engineering colleges in Japan. The Commission's tentative itinerary includes Tokyo, Hiroshima, Osaka, Kyoto, Fukuoka, Sendae, and Sappora.

Professor Harold L. Hazen, '24, Head of the Institute's Department of Electrical Engineering, is chairman of the Commission which expects to visit technical universities and institutes in Japan. Education in science and engineering in Japan has been undergoing a number of important changes since the end of World War II. In this transition, there has been a marked tendency to follow educational policies and practices which have been developed in the United States, particularly with respect to the growing cooperation between American industry and institutes of technology. This situation will receive particular attention when members of the Commission confer with leaders in Japanese technical education during the summer.

In addition to Dr. Hazen, the 15 persons appointed by the Committee on International Relations of the

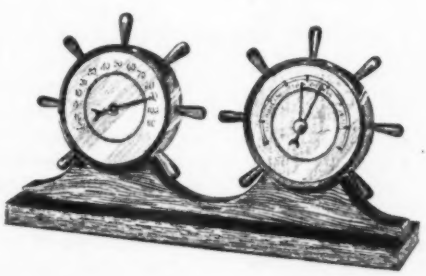
(Continued on page 496)

BUSINESS IN MOTION

To our Colleagues in American Business . . .

There is a well-known maker of thermometers, barometers, hygrometers and clocks which has been a Revere customer since 1885. You might suppose that when two companies have been doing business that long, some 66 years, they would be so close that there would be little that either could contribute to the other. Yet both of us recently learned something, which shows how wise it is to avoid taking things for granted.

During the course of a call on the customer, a Revere salesman was told that some difficulties were being experienced with the stamping and drawing of brass into cases and bezels. The Revere Technical Advisory Service was requested to investigate, and made a thorough study of the metal being used, and of factory methods and tools. The inquiry was, of course, conducted with the full consent and cooperation of the customer, who was just as eager as we were to know why, after so many years, the metal he was buying did not seem to give the usual results.



The Technical Advisory Report went into considerable detail. In broad terms, it found that such troubles as puckers, orange peel, and flare were due to a combination of factors, including composition of the brass, its temper, the design of the dies, and the lubricant used on them. New standards were set up for metal specification, covering alloy, temper, gauge. Although Revere does not design dies for fabricators, we made some suggestions for the consideration of the customer's designers.

After studying the report, the company decided to put these Revere recommendations to the proof of actual trial. It was after the correctness of our suggestions had been demonstrated that Revere received a letter of thanks, ending with these sentences: "We are extremely grateful for this information, and it represents a splendid job and one of great value to us. If all our suppliers of other materials had extended to us the type of service we have had from Revere through the years, we would have had far fewer manufacturing problems."

For several years Revere has been saying in this space that suppliers generally are glad to collaborate with their customers as does Revere. Revere considers trouble is a fine introduction, and its solution the beginning of an enduring business relationship. So do other companies in other industries, though some may take a little prodding. After all, it is a supplier's business to know his materials, as well as to make and ship them. Any company worth doing business with spends a lot of time and money learning as much as possible about its goods. When you buy, you pay for not merely so many pounds or feet or gallons or pieces or parts, but also for know-how, intelligence, information. You might as well obtain all you pay for, even if you have to dig a bit to get it. Indeed, it has been our observation that sometimes the information and collaboration that are not itemized on the bill are worth as much, if not more, than the materials themselves. So we again recommend that you take your suppliers into your full confidence, and let them work with you on problems concerning your use of their goods.

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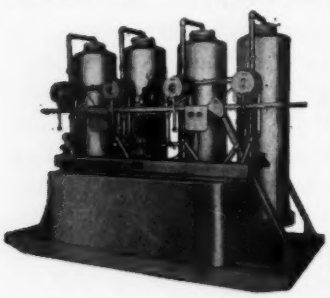

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THE INSTITUTE GAZETTE

(Continued from page 494)

American Society for Engineering Education will include three other members of the Institute's Faculty: Professor Emeritus Robert S. Williams, '02, of the Department of Metallurgy, Professor Albert G. H. Dietz, '32, of the Department of Building and Engineering Construction, and Rogers B. Finch, '41, Assistant Professor of Textile Technology and director of the Slater Memorial Research Laboratory at the Institute.

Course for Science Teachers

PLANS for a joint five-year program aimed at increasing the number of broadly trained teachers of science and mathematics at secondary schools, have been completed by M.I.T. and Harvard University. Under the new curriculum, beginning next September, young men and women will be trained in both Cambridge educational institutions for teaching science and mathematics in high schools and junior colleges. Their course will lead to the degrees of bachelor of science in general science at M.I.T. and master of arts in teaching at Harvard University.

The undergraduate phase of the project is largely at M.I.T., although some Harvard courses may be taken as early as the third year. Thereafter, students will take courses at both institutions and draw on the educational resources of both. During the fifth year, students will teach part time at local high schools, under the direction of the faculty of the Harvard School of Education.

Qualified graduates of high schools and preparatory schools will be accepted for the project. Their first two years will include the same program as taken by all other Technology students, which comprises courses in the humanities and social sciences in addition to basic work in science and mathematics. After receiving a solid foundation in mathematics, physics, chemistry, and biology, each student will further emphasize one of these major fields. At the same time, he will be able to take courses in other scientific fields under a flexible program adapted to his individual interests. The student's professional studies at the Harvard Graduate School of Education, beginning in the third year, will train him in the history and philosophy of education, education psychology and measurements, and the teaching of mathematics and science.

In undertaking this joint project, both institutions have been influenced by the key importance in our society of secondary school teachers. At present, the production of teachers of high caliber and adequate training falls far short of the demand, particularly in the various areas of science and mathematics. There is every indication that this situation will grow more acute in the next decade. The project is intended to help alleviate this shortage by increasing the number of able teachers who are qualified to an exceptional degree, both in the breadth of their outlook and in the excellence of the professional training they receive.

(Continued on page 498)

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THE INSTITUTE GAZETTE

(*Continued from page 496*)

Research and Human Relations

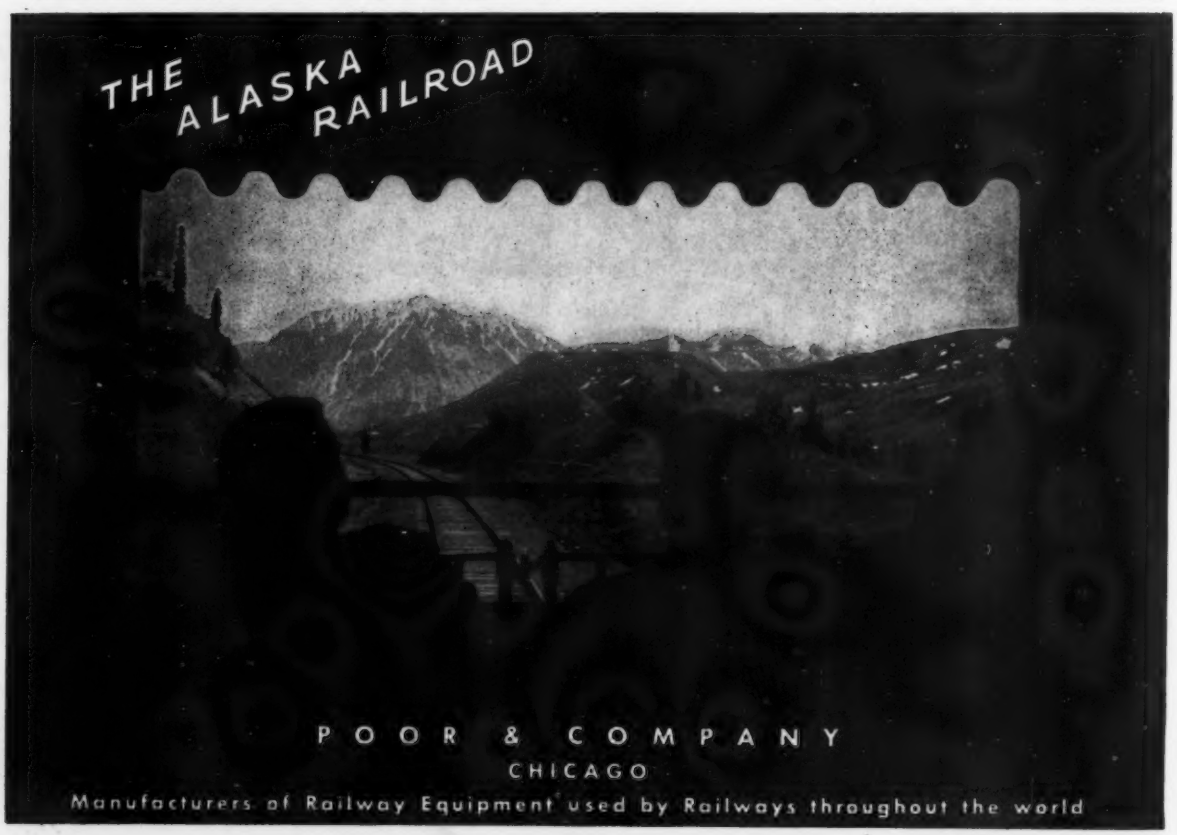
APPROXIMATELY 60 leaders from industrial research laboratories took time off to attend a two-day conference at M.I.T. on May 29 and May 30 to discuss "Human Relations Problems in Research Management," on the first day of the conference, and "The Industrial Liaison Program" on the second. The latter topic, incidentally, represents a relatively new type of co-operative union between industry and higher education in which both industry and university have unusual opportunity to benefit from the activities and experiences of the other.

In discussing human relations problems in research management, on May 29, Alexander Bavelas, '48, Associate Professor of Psychology, and Herbert A. Shepard, '50, Assistant Professor of Sociology, described experimental studies which had been conducted at M.I.T. to determine the effect of different patterns of communication on the efficiency and morale of problem-solving groups. At luncheon, Professor Walter G. Whitman, '17, Head of the Department of Chemical Engineering, spoke on "Ad Hoc Evaluation Projects for Government and Industry." In the afternoon, Paul Pigors, Associate Professor of Industrial Relations, set forth views on organizational relationships in research, stressing especially problems growing out of the transition from laboratory, through pilot plant, to production. A general discussion on research personnel problems provided opportunity for industrial research leaders to bring up problems particularly interesting to them and to benefit from the experience of others in the group. Finally, George O. Curme, Jr., Vice-president of the Union Carbide and Carbon Corporation, spoke on "Human Relations in Industrial Research."

On May 29, the Industrial Liaison Program was outlined and methods were surveyed by which this phase of Technology's activities could be more effectively co-ordinated with industry. Formal talks were given by members of the Institute's staff during the morning session, whereas at the luncheon, informal discussions were held about the aviation, chemicals, electronics, food, manufacturing, metals, and petroleum industries.

Throughout all of these discussions was the theme of mutual co-operation between industry and the Institute. The group effort in research, developed to a high degree during World War II, is applicable to the peacetime promotion of technology, and such a program has been under progressive development for several years. Industry can benefit from such a program by being kept abreast of developments in a wide range of fields having indirect bearing on its main operations. On the other hand, the Institute benefits its Faculty and staff by bringing to classroom teaching a better contact with the most recent industrial problems.

(*Continued on page 500*)



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H. M. Butler	'50	J. W. Wilton, Jr.	'50		

Geologists' Survey

THE Visiting Committee on the Department of Geology* met at the Institute with Professor George R. Harrison, Dean of Science, in the office of Professor Robert R. Shrock, Head of the Department, on December 11, 1950. The following report attempts to call attention to the present status of the Department of Geology – its present activities, its facilities and equipment, its needs for efficient operation, and its plans and hopes for the future.

The total enrollment in the Department for the school year 1950–1951 is the largest that the Department has ever had. Enrollment has increased steadily since World War II and members of the Department feel that the present total enrollment of 90 students is about as many as can be handled with the present facilities, space, and staff.

The nine bays of additional space made available to the Department during the summer of 1950 have relieved the great pressure for space that has dogged the Department since it moved to Building 24. They have provided space for a geophysical and a research laboratory, and a place to house members of the teaching staff. In addition, space in Building 20 has been cleared and equipped with facilities for undergraduates who wish to do their thesis work there.

The Committee was shown the development of a new geophysics laboratory in Building 24 which was made possible by a special appropriation. It is the beginning of what the Department hopes will become a Division of Geophysics. The Committee was also shown the excellent collections of sedimentary rocks and fossils in Building 24 and was particularly impressed by the intensive use that was being made by both graduate and undergraduate students of the five new petrographic microscopes and five new binoculars that were purchased a year ago from a special fund made available by the Administration. These new microscopes make available modern equipment for the study of sedimentary rocks and fossils, both of which are of such vital importance to the petroleum industry.

Since the last meeting with a Visiting Committee, the Mineralogical Laboratory has been equipped with a ventilation system by which obnoxious and dangerous gases can now be evacuated, and the previous health hazard definitely ameliorated. The Committee was informed that the Department, through recent purchases, is now equipped with excellent projection equipment and screens, and considers that this type of equipment is absolutely essential for teaching students, for demonstration purposes, and for use in seminars or general lectures.

(*Continued on page 502*)

*Members of this Committee for 1950-1951 are: Louis S. Cates, '02, chairman, Godfrey L. Cabot, '81, William C. Potter, '97, Robert B. Sosman, '04, Victor Dolmage, '17, Guillermo Zuloaga, '30, and Thomas B. Nolan.

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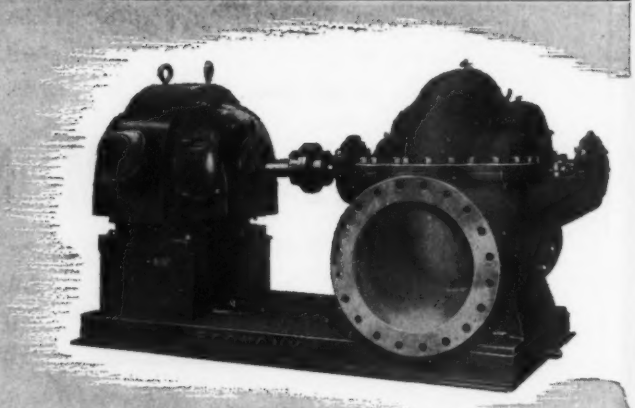

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If the directors of the laboratories select your idea for development, they will make, in most cases, a very simple deal with you: In return for the laboratories' investment of time, facilities, money and personnel, Sinclair will receive the privilege of using the idea free from royalties. This in no way hinders the inventor from selling his idea to other companies or from making any kind of arrangements he wishes without further reference to Sinclair.

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THE INSTITUTE GAZETTE

(Continued from page 500)

The Department is very concerned over its undergraduate program of instruction and has been giving considerable study to this program for the purpose of revising it, so that it will have even greater strength and breadth than at present. As a result of a study now in progress, the Department expects to petition the Committee on Undergraduate Instruction for a number of important modifications to the two options now offered in the Department. These modifications will make the program better adapted to the training of geologists who go into the petroleum industry.

The most important modification that has been made in the undergraduate program in many years was made three years ago when arrangements were completed with tha Nova Scotian Government, by which a summer camp was established at Crystal Cliffs near Antigonish. This Summer Field Camp is described in the May, 1951, issue of The Review.

As a further effort to improve the undergraduate program of instruction, the Department hopes to make arrangements with one or more geophysical exploration companies by which juniors in Option 2 (geophysics), and possibly some seniors in Options 1 and 2 (geology and geophysics), will be able to spend a summer in the field with an active exploration party.

The Committee noted with approval how the more active professors in the Department have developed groups of enthusiastic graduate students working with them, and feels that this method of scientific training is excellent. It noted particularly the vigorous groups working with Louis H. Ahrens, Assistant Professor of Geology, Martin J. Buerger, '24, Professor of Mineralogy and Crystallography, Harold W. Fairbairn, Associate Professor of Geology, Patrick M. Hurley, '40, Associate Professor of Geology, Walter L. Whitehead, '13, Associate Professor of Geology, and Robert R. Shrock, Professor of Geology.

In the above record, the Committee detected a strong feeling of co-operation between the professors and the graduate students for the type of research work that they are carrying on. Certainly a general program of research such as that now being conducted in the Department of Geology should be encouraged, and if possible extended, because such a

(Continued on page 504)

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THE INSTITUTE GAZETTE

(Continued from page 502)

program produces two important results: It produces well-trained scientists who can leave the academic halls fully prepared to carry on investigations elsewhere; and it produces original contributions while the students are being trained.

The Committee noted with great concern that the Lindgren Library had not been moved to a place near the present Geology headquarters, with the result that the library is not finding its intended use by either staff or students, and urged strongly that the Administration extend every effort possible to make the facilities of Lindgren Library more available than at present.

The Committee visited the Petrography and Mineral Deposits Laboratories, where microscopic work goes on in connection with learning the use of the petrographic microscope and studying the relation of the minerals in rocks, and was impressed with the poor condition of the microscopes in both of these departmental laboratories.

The Committee felt that too much emphasis could not be put on the necessity for providing modern laboratory instruments, such as petrographic microscopes and binocular microscopes. These instruments are absolutely essential for adequate training in different aspects of microscopic work in geology. It is the opinion of the Committee that the greatest need in

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C. Develop a broad and strong program of graduate instruction and research designed to produce able field, laboratory, and theoretical scientists who can investigate a wide range of problems concerned with the physical characteristics, chemical nature, structure and architecture, and geological history of the earth.

D. Develop a staff who can conduct the proposed program of instruction and research, and who themselves will carry on specialized research of their own that will develop new ideas and principles, and expand the applications of existing theory.

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(Continued from page 490)

been happening to the quality of the Institute's program, to the effectiveness of its education and its environment.

This Year's Educational Progress . . .

Let me cite a few examples of the progress and changes which have been made in our educational program. Since the war we have had the study and report of the Committee on Educational Survey—a report which is exerting great influence in the refinement and development of our educational activities. In response to one of the recommendations of this report, we have established a School of Humanities and Social Studies, which gives formal expression and adequate status to our developing programs in general education and social sciences. Again on the recommendation of the Committee on Educational Survey, the Faculty has authorized two additional, elective terms to be added if desired by students to the present eight terms of general education which we have in our undergraduate program.

Two recent grants by foundations to the Institute may be cited as typical of some of the innovations taking place in our educational program. The first of these came to the Institute without being sought by it, although the grant was no less needed or welcomed. This grant, totaling $150,000 was made by the Carnegie Corporation to be expended by the Institute over a period of five years for the purpose of strengthening its work in the humanities and social sciences. This grant was made by the Carnegie Corporation in recognition of the Institute's developing

(Continued on page 508)

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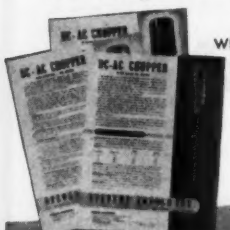

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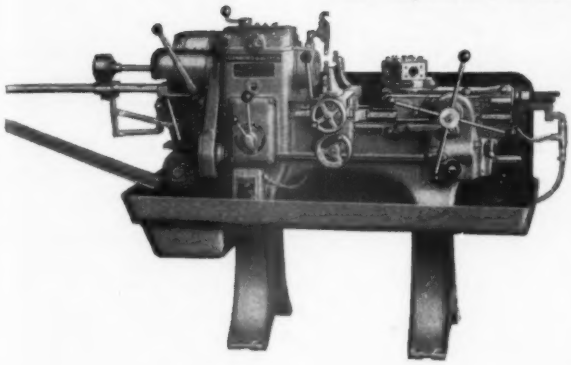

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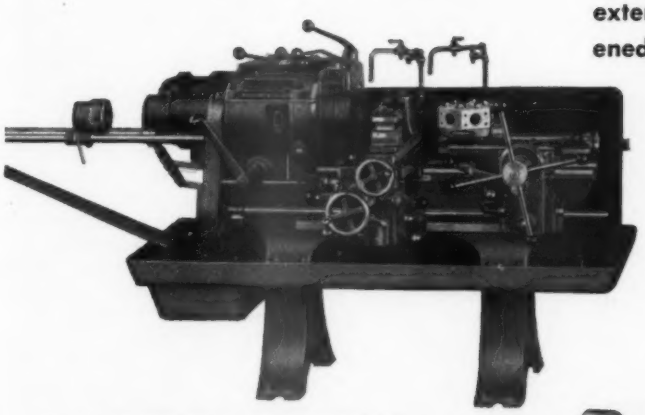

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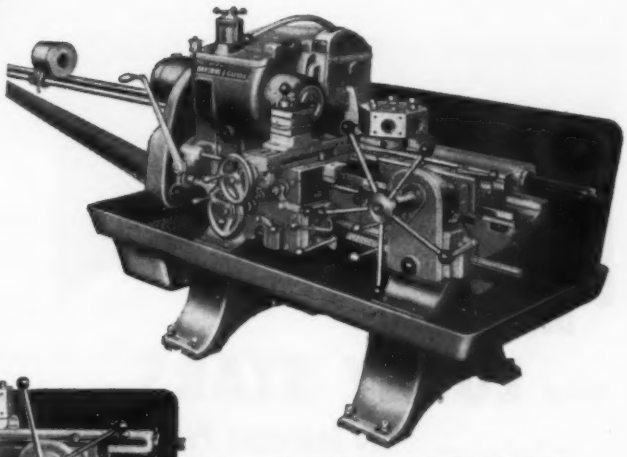

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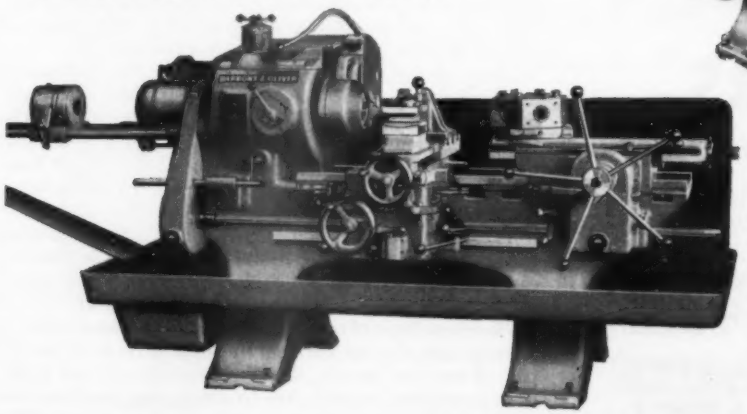

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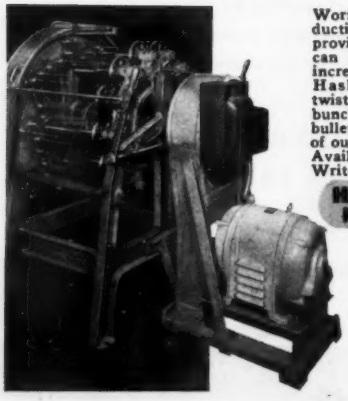

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ALUMNI DAY

(*Continued from page 506*)

program in this field and in response to its own conviction that our institutes of technology have a great opportunity and responsibility to train men who can assume leadership in our increasingly complex society.

This important grant is to be used by John E. Burchard, '23, Dean of Humanities, and his associates in a variety of ways, including releasing two or three of our professors each year from normal teaching duties so that they can make careful studies of programs in general education at other institutions; the appointment each year of a distinguished teacher of humanities as a visiting professor, these appointments to be known as the Carnegie Visiting Professorships in the Humanities; the provision of stipends for young men appointed to our Humanities Faculty so that they may have half of their time free for scholarship; and finally experiments in honors groups in the humanities.

The second grant is one of $150,000, made to the Institute by the Commonwealth Fund, to enable our Department of Biology to provide postdoctoral training for men who have completed their medical education. Our Department of Biology has been attracting an increasing number of men who have completed their work for the M.D. degree and who wish to acquire advanced research techniques in the field of biology which will make them more effective for careers of research in the field of medicine. The doctors of medicine who take this program at the Institute spend usually one or two years here and then take research posts in medical institutions.

This program is indicative of two important developments at the Institute. One is the growth of our work in the field of the life sciences. Our Department of Biology has become distinguished as a center for the quantitative study of biology, the application of the techniques of physics and chemistry to the life sciences. Second is the steady growth at M.I.T. of interest in medical and biological problems. The Radioactivity Center in Physics, for example, has made many important contributions to medicine through the development of the application of radioactive tracer techniques to many clinical and medical problems. The High Voltage Laboratory in the Department of Electrical Engineering, utilizing the Van de Graaff generator, has made important advances in the application of high-energy radiation to the treatment of malignancies, and the Acoustics Laboratory is working on the use of ultrasonics for diagnostic purposes.

Many of the new programs and activities mentioned have, of course, been made possible by the successful completion of the M.I.T. Development Program. The Corporation and Alumni of the Institute joined in carrying through to a successful conclusion one of the largest fund-raising campaigns ever undertaken by an educational institution.

This does not mean that M.I.T.'s financial problems are solved. It does mean that it and other private institutions can continue to secure generous support from private sources. The success of this and other major efforts to fund the independence of our great private institutions comes as a recognition that educational free enterprise is still a vital part of our free society, that the institution which is free of governmental control, free to set its own standards and goals, and free to preserve its own freedom, is one of the bulwarks of America.

In order to make sure that we continue to find the additional resources which the Institute must have to maintain its position and to move ahead, we have established a permanent Development Office, and I am happy to re-

(*Continued on page 510*)

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ALUMNI DAY

(*Continued from page 508*)

port the appointment of Ralph T. Jope, '28, as director of the Development Office of the Institute.

My report to you would be incomplete without some reference to those broad policies of the Institute which have been designed to adapt it to the current emergency.

Intellectual Tax on Scholars . . .

At the present time the Federal Government is calling on the universities for millions of dollars of research bearing upon our national defense. It is imposing, and quite properly so, an intellectual tax on our communities of scholars in the form of expert consultation and services on a large scale. All of this is proper and necessary and illustrates the position of basic importance in our national life which our educational institutions have come to occupy. I am proud of the fact that M.I.T., its Faculty, and its students have shown the adaptability and flexibility and public spirit to make this emergency contribution to our national welfare, while continuing their normal activities. As we undertake these emergency responsibilities, however, I think it important that we never lose sight of the basic educational objective of the Institute. We must make sure that we continue to maintain our standards and train as many men as our own resources and national policy permit us to educate.

Under present conditions when man-power shortages are so great and specialists are pulled in so many directions, it is particularly important that places such as M.I.T. give high priority to those activities and men who are primarily concerned with education. We must, for example,

(*Continued on page 512*)

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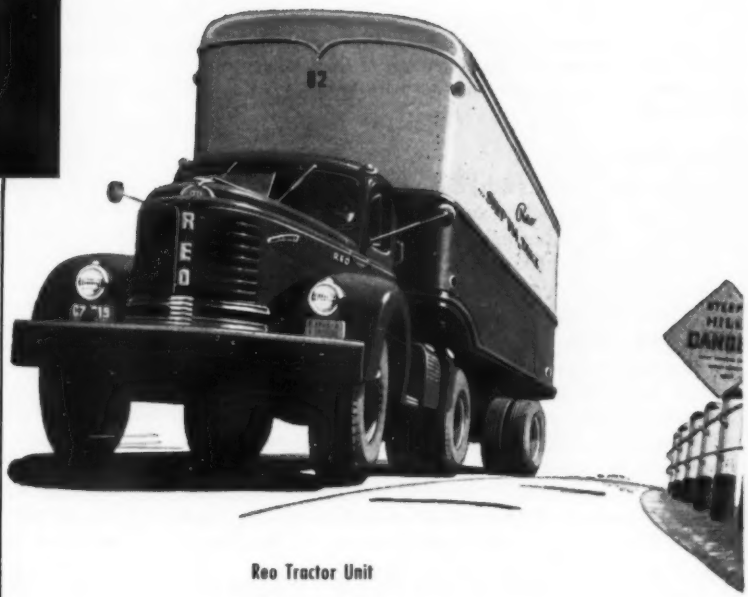

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ALUMNI DAY

(*Continued from page 510*)

give the professor a sense of his importance as a teacher and a creative scholar. We must make sure that we preserve the incentives and environment for creative teaching and scholarship.

As we accept our emergency responsibilities we must be sure to recognize that teaching and scholarship warrant high priorities in the allocation of man power. Only by doing so can we prevent the man-power shortages of the future.

For All to See . . .

After Dr. Killian's address, visitors were free to inspect new construction on the M.I.T. campus. In addition to the Charles Hayden Memorial Library, which was dedicated a year ago, new structures open for inspection were the Hydrodynamics Laboratory and Ship Model Towing Tank (see Technology Review for June, 1951), the Sloan Building which will quarter the new School of Industrial Management and the proposed Faculty Club, and the 12-million-electron-volt Van de Graaff generator. Under construction at the present time, with concrete pouring virtually completed but no interior work finished, are the Sloan Metal Processing Laboratory and the John Thompson Dorrance Laboratory for Biology and Food Technology, both of which adjoin the Institute's main group of educational buildings.

Light refreshments were served to Alumni Day guests at the open house reception at the President's House between 4:00 and 5:30 P.M. The reception provided many Alumni their first opportunity to see the President's House since it has been occupied by Dr. and Mrs. Killian.

Prior to the Stein-on-the-Table Banquet, many classes convened for informal gatherings in private rooms in the Copley Plaza.

Alumni Banquet . . .

With Mr. Lunn as toastmaster, 931 Alumni, honored guests, and Faculty members attended the Stein-on-the-Table Banquet to participate in what has become the high light of Alumni Day activities.

David A. Shepard, '26, recently elected member of the M.I.T. Corporation, made the presentation of the 25-year Class gift to Dr. Compton – a check slightly in excess of $150,000. For the 50-year Class, Albert W. Higgins, '01, presented a check for $71,000, although other contributions from this Class have brought its total gifts to the Institute to the sum of nearly $1,000,000. Both of these evidences of grateful loyalty were graciously received and acknowledged by Dr. Compton.

Mr. Lunn then introduced Marshall B. Dalton, '15, who made his final report on the recently and successfully completed Development Program. Whereas the original objective was to raise $20,000,000 during this program, the final report shows that $25,800,000 has been raised by the Committee, headed by Alfred P. Sloan, Jr., '95, as honorary chairman, Marshall B. Dalton, '15, as general chairman, and Ralph T. Jope, '28, as assistant executive director, in a program in

(*Continued on page 514*)

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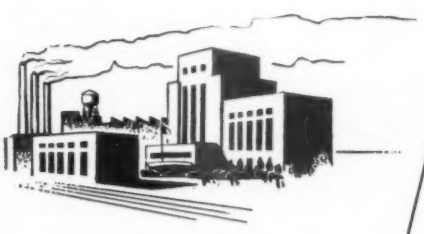

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ALUMNI DAY

(*Continued from page 512*)

which 5,000 Alumni and friends of Technology took part. In formally closing this chapter of the Institute's fund-raising activity, Mr. Dalton presented to Dr. Compton a Book of Remembrances which included the names of all who had supported the program during the two and one-half years it was in effect. The volume was received by Dr. Compton who stated that it would occupy a prominent place in the Institute's historical collection.

Donald P. Severance, '38, Secretary and Treasurer of the M.I.T. Alumni Association, was then called upon to conduct Professor George R. Harrison, Dean of Science, to the speakers' platform to receive a certificate attesting to his election as an honorary member of the Alumni Association. In responding to this recognition for his distinguished service, Dean Harrison pointed out that he became an Alumnus of M.I.T. the hard way – that whereas most students achieve that status after four years, it took him 21 years of hard work at M.I.T. to become an Alumnus. In accepting his certificate of membership, Dean Harrison chose to be affiliated with the Class of 1898 which had "adopted" him as a member several years ago.

Banquet Addresses . . .

Richard M. Bissell, Jr., Deputy Administrator of the Economic Cooperation Administration and Professor of Economics on leave of absence from the Depart-

(*Continued on page 516*)

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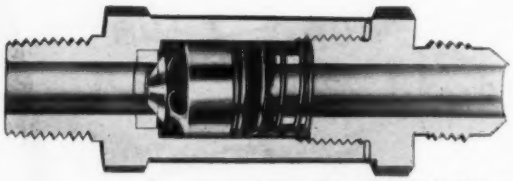

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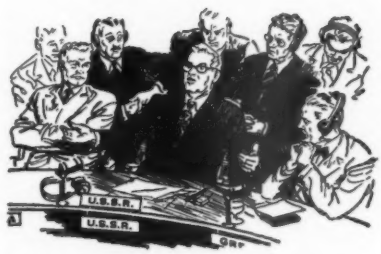
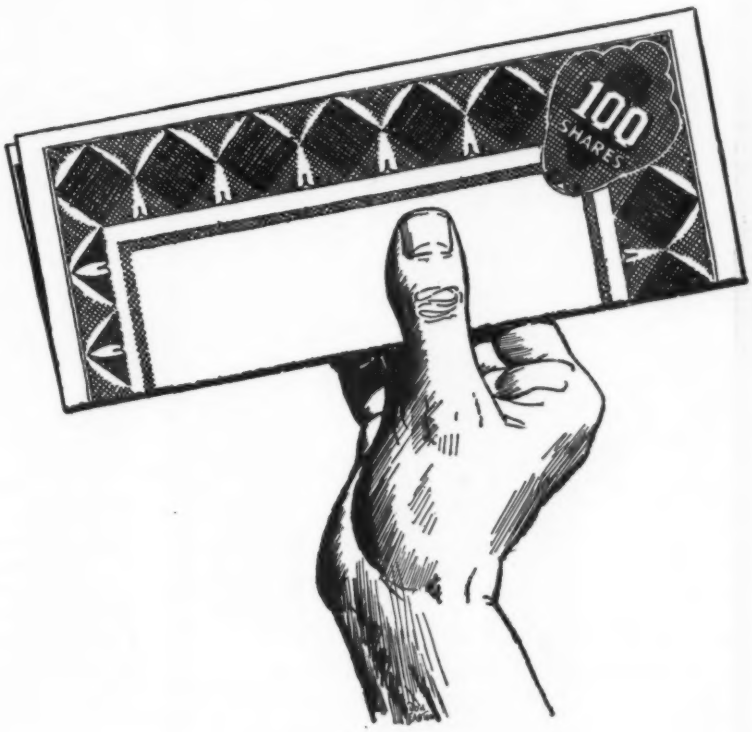
Who owns big business anyway?



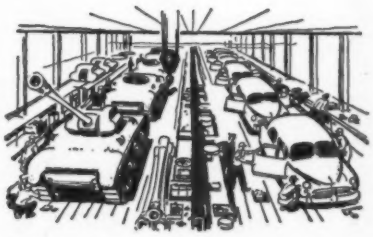
1. Many people, including the Russian delegates to the United Nations, don't seem to understand who owns America's corporations. They continually talk about "Big Business" and "Wall Street Capitalists" as if our big companies were owned and run by a handful of "economic royalists."

2. As a matter of fact, practically all large American corporations are owned and run *by the American people.* Union Oil Company, for example, has more than 36,000 stockholder-owners. 33,613 of our common stockholders are individuals—15,528 women and 18,085 men. The remainder consist of some 2,500 educational, religious and charitable institutions, labor unions, insurance and trust companies.

3. Approximately half of Union Oil's common stock is owned by stockholders who have 500 shares or less. Average shares per stockholder is 146. Naturally there are many larger holdings than this and many smaller, but our largest stockholder owns only 2¼% of the total stock. Our directors and officers combined own 2½%.



4. In other words, Union Oil Company is owned not by a few dozen millionaires but by many thousands of ordinary Americans. And this is true of practically every U. S. corporation.* So when the Communists argue that their system would allow the American "people" to "own" their industries, they're whistling up the wrong drainpipe. The American people own their industries already.



5. The big difference is that our system provides the incentives to the individual, the competition and the efficiency that go with private ownership. Consequently, our industries are able to outproduce, outprogress and outdo the Communists' by a country mile. And our people are free to spend their money, put it in the bank, invest it in stocks or bury it in the back yard—whichever they darn well please.

**More than 15 million Americans own stock in some U. S. corporation. In addition to these, everyone who has a life insurance policy will find some of his "cash value" invested in corporations. So, altogether, probably 8 out of 10 American families have a direct or indirect stake in U. S. corporations.*

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ALUMNI DAY

(*Continued from page 514*)

ment of Economics and Social Science at M.I.T., delivered the banquet address, "The Strengthening of the Free World." Commenting on the general feeling of frustration which pervades Washington, Professor Bissell told his audience that for the past five years "it is true that we are on the defensive, unavoidably and inevitably." In spite of high expenditures of taxpayers' money, this nation is still unprepared in man power and equipment for outright combat, and is outnumbered in these facilities by the Soviet Union. Professor Bissell believes that the Marshall Plan has been effective in weaning some European countries away from Communist domination, and mentioned Italy and France as examples. In combating the growth of Communism by economic aid to foreign countries, rather than by military preparedness, Professor Bissell compared the E.C.A.'s budget of 16 billion dollars, spent over a three-year period, with the present 60-billion-dollar budget of the Department of Defense.

Informal remarks by President Killian constituted the final event of the evening. Stressing the success of the Development Fund and the need for privately endowed educational institutions to remain free to follow their own objectives devoid of government direction, President Killian stated that the financial program for maintaining the Institute's independence would be placed in the newly established permanent Development Office. Speaking in warm and glowing terms of the service which had been rendered by Mr. Jope in fund-raising activities during the Development Program, President Killian recalled his announcement at luncheon, that Mr. Jope had been appointed director of the Development Office. Further details regarding this topic will be found on page 492.

But the major message which President Killian delivered at the banquet dealt with the shortage of technically trained personnel in the current national emergency. Warning of "the grave shortage of scientists and engineers which we face in this country at the present time," he said that this shortage will become still more acute in the next few years. Continuing with this general theme, Dr. Killian said:

> This shortage came about because of the unfortunate estimates given national distribution by the Bureau of Labor Statistics several years ago. These estimates at that time indicated that the country was faced with a surplus of engineers, and the report had an obvious effect on the number of young men going into engineering schools.
>
> Last year the engineering schools of the country graduated about 50,000 young engineers. This, of course, was an exceptionally high number, reflecting the wave of G. I.'s which had been going through the colleges. Based upon present enrollments, estimates have been made which indicate that in 1954 we will turn out of our engineering schools from 12,000 to 16,000 engineering students. This compares to an output from our engineering schools just before World War II of some 20,000 engineers a year.
>
> Because, therefore, of a decreased enrollment in the entering class this year and the prospect of a similarly

(*Concluded on page 518*)

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ALUMNI DAY

(*Concluded from page 516*)

small freshman class next year, we face the possibility of turning out fewer engineers than we educated before World War II. These figures do not reflect further curtailments that may come about as a result of Selective Service. Actually the country's demand for engineers is greatly in excess of what it was before the war. Estimates now place the annual demand for engineers around 30,000 graduates a year.

This year the total number of engineers graduating will be on the order of 38,000, but of this total industry can count on getting only about half. According to a study recently made by the Engineering Manpower Commission of the Engineers Joint Council, industry will have a deficit of about 11,000 engineers this June. While industry will get half of the number graduating this year, estimates indicate that they will get only one-fourth their needs next year. Again this does not take into consideration the need for engineers and scientists on the part of military establishments or other government operations.

Our own experience with this year's group of graduates points up these over-all figures which I have reported on. M.I.T. could have placed this June three or four times as many graduates as we had available for jobs. In some fields the demand is almost fantastic. Nathaniel McL. Sage, '13, Director of our Division of Industrial Coöperation, tells me that the companies are eagerly taking men who are likely to be drafted or who are in the Reserve Officers' Training Corps, on the gamble that they can have them long enough to establish a tie and thus have some chance of getting them after their military service. This is based on a long-range view, on the part of the companies, that the peak of the shortage will come a few years hence.

Let me give you just a few examples of the kind of demand that we have been experiencing. One company reported to our Placement Office that it is prepared to take three times the number of men that we are graduating this year from one of our major departments.

Another company has a goal of employing 200 Ph.D.'s and 2,000 bachelor and master's degree men. Still another company has raised its normal quota for technical men fourfold. Two companies alone, that have talked with us, are prepared to take nearly 10 per cent of this year's total output of all engineering schools in the country.

I believe it important that we do everything possible in this country to attract outstanding young men into the engineering colleges.

Finale . . .

Dr. Killian paid a warm tribute to the co-operation of the officers of the Institute's Alumni Association, who, he said, had sought to strengthen the Institute's Administration at every turn.

Upon conclusion of President Killian's address, Mr. Lunn announced adjournment of the banquet. In the general exodus which followed, some hurried to catch trains, some lingered for a parting handshake or to wave a final good-by, and a few of the more energetic continued the evening of sociability wherever their fancy and facilities directed. But whatever the circumstances of their departure, in each case there were two common elements. Each person had a tight clutch on the 1951 Alumni Day stein, with its picture of William Barton Rogers, First President of M.I.T., and all were looking forward to reunion on Alumni Day, 1952.

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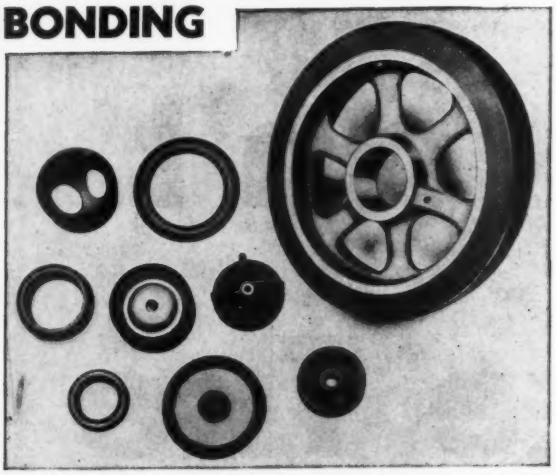

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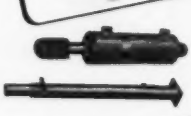

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THE MARK OF QUALITY

TRADITION AND PROGRESS

(Concluded from page 480)

education and religion to help us achieve this integrity of mind and conscience, without which the progress or even the continuation of civilization is in jeopardy. Of this high end I venture one brief and a final word to you.

You and I are set to live and to labor in a world that is out of balance. This condition is not of recent origin. For a good many centuries the world was badly out of balance because of man's arduous efforts to gain mastery over nature. Having achieved a marvelous control over his environment, it must be said, alas, that man has achieved no such notable control over himself. Seeding the clouds to produce rain, splitting the atom to facilitate healing or destruction, inventing a machine that can calculate more rapidly than the human brain — these are wonderful achievements by man in the field of technology. But what will they profit our generation if we cannot tell the difference between right and wrong in terms of our personal conduct, if we cannot increase the hero in us at the expense of the coward, if we continue to confuse ends and means in our view of life, if we have acquired no invisible means of support in terms of faith in someone greater and more enduring than ourselves; namely, God, our Father. This struggle to be masters of ourselves that we may be the servants of others involves every one of us all. By thus stabilizing one's own life, one adds a very important bit of ballast to a world that is out of balance, and thus helps to again restore its equilibrium.

Well, to your posts, as mind and conscience may dictate. Never forget that it isn't what happens to you in life that matters; it's the way you face life that really counts. Therefore, follow your best insights until fear becomes courage and the meager heart grows generous; and, instead of race and nation, the whole world turns out to be your fatherland. Labor to keep alive the learning you have received here, the dreams you've cherished, and the hopes you have shared. They represent some very important but unfinished business which you may yet complete. Every now and then take a good look at something not made with the hands: a mountain, a star, the turn of a stream. There is wisdom, patience, solace, and, above all, the assurance that you are not alone in this wild and troubled world to be gained from these representatives of the world of nature.

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THE NEED FOR UNITY

(*Continued from page 475*)

nually on our side than there is on the side of the Soviets — 272 million metric tons against 44 million metric tons.

I suggest that the question comes down to this: Have we any choice except to mobilize these great stockpiles of free traditions and materials into a giant drive for peace? Throughout Western Europe and the rest of the free world that question is being asked of the United States, and like the Ancient Mariner's wedding guest, we cannot choose but hear.

As the free world stands today, mobilization for winning the peace can be only as effective as American leadership and hope will make it. A new kind of leadership is called for. In a modern, interdependent world there is no room for dictator nations. American leadership must be that of a leader among equals. It must depend on persuasion rather than coercion, on understanding rather than edicts. But before we can lead, we must unite. We must unite to make sure we are strong, first of all, on the military front. With our free partners in Western Europe, we need military strength of an order which will effectively discourage or defeat aggression. This, may I point out, is military strength quite different from the man power and fire power needed to conquer a particular country. We must unite to be strong on the economic front. Our first, and greatest, obligation is to keep our country strong; and we must keep other free nations strong by helping them to help themselves. We must unite to be strong on the political front. If we really cherish the dream of a free world, we quite clearly must put all our vigor behind the institutions that are designed to unite honorable nations for the common defense of peace; namely, the United Nations and the Atlantic Pact. We must unite for strength on the propaganda front. The false promise of Communism across the "Voice of Moscow" can be heard daily by approximately 800,000,000 people. At the end of the war, only 200,000,000 people were within range of the Kremlin's transmitters.

We don't stand a chance of leading the free world to peace unless we can stop quarreling among ourselves and hating one another. The very least we can do for ourselves, the free world, and for our hundreds of thousands of men in Korea is to save our hate for our foes, unite here at home, and knuckle tightly down to the job of winning the peace. If we really mean what

(*Concluded on page 524*)

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THE NEED FOR UNITY

(*Concluded from page 522*)

we say about wanting peace, first, last, and always, we have got to have unity among ourselves and with our friends. There are some practical tests we can use right at this moment to determine whether unity is lip service or a fact. The first practical test is the extent to which we back up General Eisenhower in Europe; and the second, General Ridgeway in Korea and Japan. Where General Eisenhower is concerned, we all know that we have in him the ideal supreme commander for the new European army. He has the power to inspire, the capacity to develop a workable program, and the toughness to see to it that every country carries its fair share of the burden of defense. Without involving myself in the controversy over General MacArthur, I should like to urge that we stand back of General Ridgeway with everything we have. Any dissension here at home will be marked up on the bitter scoreboard of Korea.

The third test is the intelligence and common sense we display in our support of foreign-aid programs to help our free-world partners to rearm and, in the process, to keep their own economies strong and healthy. A withdrawal of all aid could well lead to disunity and even disaster. The logistics of a successful campaign for peace are not simple. They are fantastically involved. The supply problem covers the world. It includes food, rehabilitation, transportation, measures to strengthen national economies, direct aid to exiles from countries behind the Curtain, education, unity of purpose and hope — to name only a few components of peace that must be mustered.

But if we will only take to heart the lessons of interdependency in our own country, we can handle this fabulously difficult job so well that the last 50 years of the Twentieth Century may well be the brightest of all time. Each moment in history is only as great as the challenge of the moment. For that reason alone I think we are living in a privileged period.

I would like to conclude with the words of a man I revered as much as any American of our day. Arthur Vandenberg not long ago wrote me a letter from his sickbed. Referring to the unpartisan spirit which launched the Economic Cooperation Administration, he wrote: "This working unity typifies our finest traditions and our greatest safety in the presence of external hazards to all Americans, regardless of party. United, we stand. Divided, we fall. I want America to stand."

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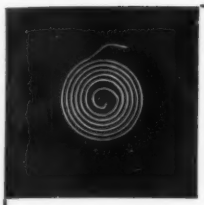

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FUNDAMENTAL KNOWLEDGE

(Concluded from page 472)

work more effectively. It must assume a leadership role in the education of its people on the economic facts of life and the functions of enterprise and the processes of the productive economy. All this must be done, without fear or favor, in recognition of management's great responsibility for the protection and perpetuation of a free society.

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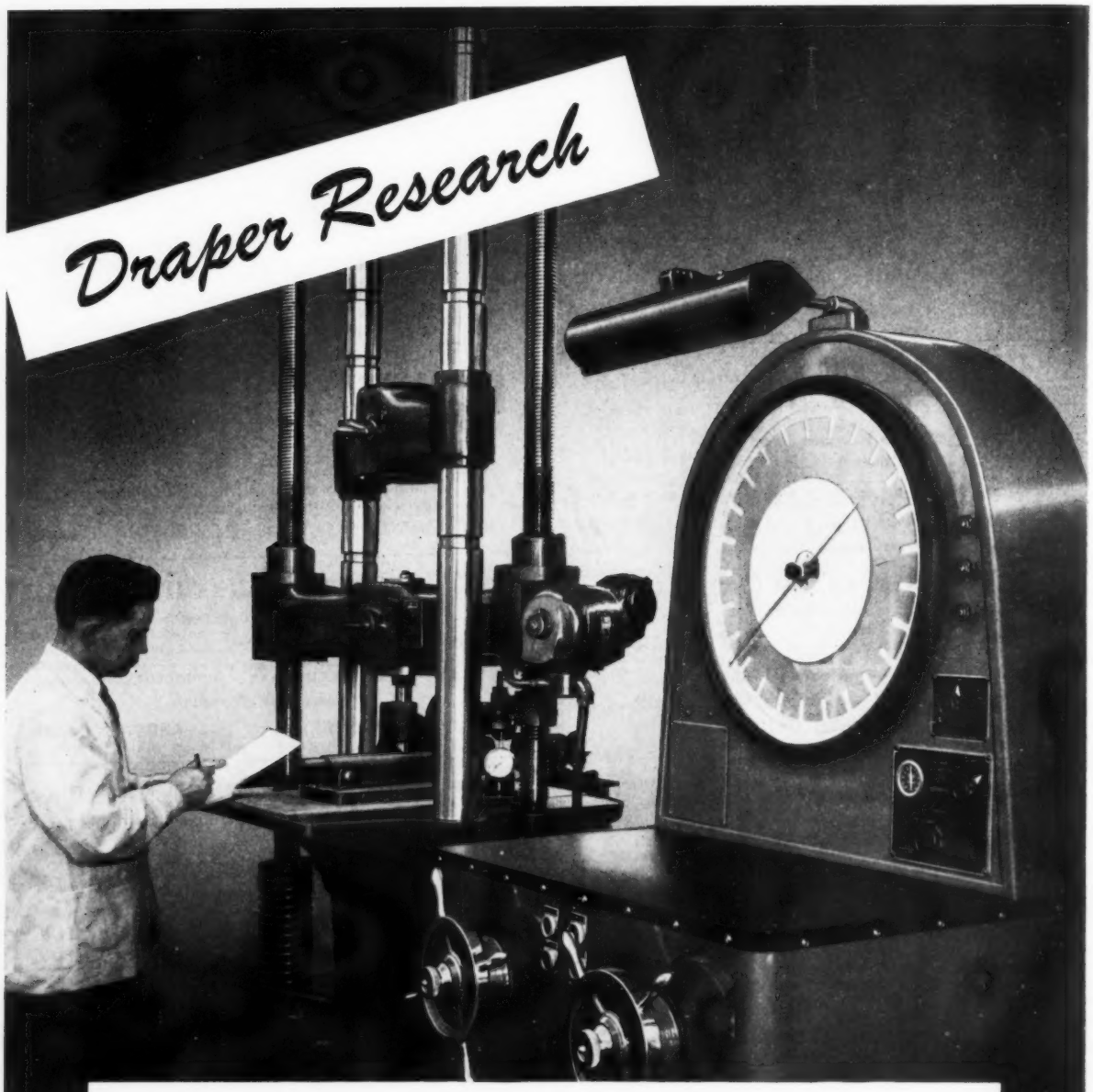

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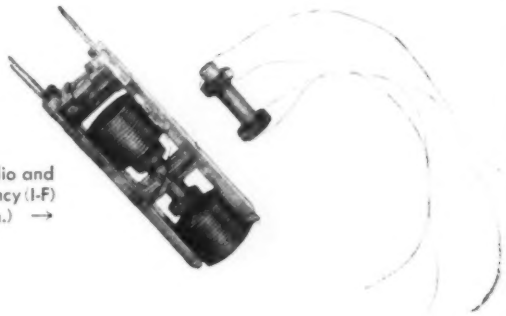

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